

US EPA ARCHIVE DOCUMENT

Sulfuryl Fluoride  
PC Code: 078003

Dietary Exposure Assessment

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## UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OPP OFFICIAL RECORD  
HEALTH EFFECTS DIVISION  
SCIENTIFIC DATA REVIEWS  
EPA SERIES 361

OFFICE OF  
PREVENTION, PESTICIDES  
AND TOXIC SUBSTANCES

### MEMORANDUM

Date: January 13, 2004

Subject: Chronic Dietary Exposure Assessments for Sulfuryl Fluoride and Fluoride Anion, Addressing the Section 3 Registration of Sulfuryl Fluoride on Stored Cereal Grains, Grain Processing Facilities, Dried Fruits, and Tree Nuts. PP# 1F6312.

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To: Michael Doherty, Chemist  
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RC  
02/04

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## Executive Summary

Chronic dietary risk assessments were conducted using the Dietary Exposure Evaluation Model (DEEM-FCID, Version 1.30), which uses food consumption data from the USDA's Continuing Surveys of Food Intakes by Individuals (CSFII) from 1994-1996 and 1998. The analyses were performed to support a Section 3 registration request and address dietary exposure to sulfuryl fluoride as well as fluoride anion. A chronic population-adjusted dose of 0.003 mg/kg/day was used to assess dietary risk resulting from the consumption of sulfuryl fluoride. Separate analyses, using the toxicological findings of the Office of Water, were made for fluoride residues resulting from the use of sulfuryl fluoride and cryolite, as well as background residues in food and in drinking water. Toxicological doses for use in the fluoride risk assessments were derived from standard water consumption estimates and NHANES body weight averages which were combined with the maximum concentration limit (MCL) of 4 ppm, which is protective of skeletal fluorosis.

*Sulfuryl Fluoride.* The chronic analysis for sulfuryl fluoride used average residue values from residue trials reflecting the maximum proposed use, percent market share estimates, and a dilution factor for flour commodities to reflect the pre-fumigation draw-down practice in grain processing mills. Based on these assumptions, the refined chronic dietary risk estimates for all population subgroups are less than 1% of the chronic population-adjusted dose (cPAD) of 0.003 mg/kg/day.

*Fluoride - Sulfuryl Fluoride and Cryolite Uses.* The chronic analysis for fluoride coming from the pesticidal uses of sulfuryl fluoride and cryolite used average values from residue trials most closely reflecting the maximum proposed use, percent market share (sulfuryl fluoride) and percent crop treated (cryolite) estimates, and a dilution factor for flour commodities to reflect the pre-fumigation draw-down practice in grain processing mills (sulfuryl fluoride only). Based on these assumptions, the refined chronic dietary risk estimates for all population subgroups are less than 1% of the MCL for residues coming from sulfuryl fluoride and less than 2% of the MCL for residues coming from cryolite.

*Fluoride - Background Residues in Food.* Residue values from open literature were used to assess the contribution of fluoride exposure from background residues in foods. Where multiple estimates were available, the highest values were selected. For foods that may be processed in fluoridated water, residues from samples processed in fluoridated water were selected in preference over those processed with unfluoridated water where such data were available. This results in a moderately conservative estimate of fluoride exposure from food. Risk estimates range from approximately 3% to approximately 16% of the MCL.

*Fluoride - Residues in Water.* The assessment addressing the exposure to fluoride in water assumed that tap water for all individuals contained residues of fluoride at 2 ppm. For sources other than tap water (e.g., soft drinks), the assessment assumed a concentration of 0.4 ppm. While these assumptions do not reflect the highest concentrations of fluoride found in the U.S. water supply, they are reasonable estimates when compared against average residues in

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monitoring data. Based on these inputs, risk estimates from water range from approximately 18 to 31% of the MCL, with the highest estimated risk occurring for non-nursing infants.

None of these routes of exposure have risk estimates that exceed HED's level of concern for either sulfuryl fluoride or fluoride anion. Combined risks from the various dietary sources of fluoride exposure range from 18 to 34% of the MCL and, therefore, are also below HED's level of concern. Aggregate risks addressing dietary and non-dietary exposures to fluoride will be addressed in the forthcoming human health risk assessment for fluoride (M. Doherty, D295958, in preparation).

## **I. Introduction**

Dietary risk assessment incorporates both exposure and toxicity of a given pesticide. For acute and chronic assessments, the risk is expressed as a percentage of a maximum acceptable dose (i.e., the dose which HED has concluded will result in no unreasonable adverse health effects). For most instances, this dose is referred to as the population adjusted dose (PAD). The PAD is equivalent to the Reference Dose (RfD) divided by the special FQPA Safety Factor. In the case of fluoride, HED has converted the MCLG of 4 ppm established by the Agency's Office of Water to a mg/kg/day basis using body weight and water consumption data.

For acute and non-cancer chronic exposures, HED is concerned when estimated dietary risk exceeds 100% of the PAD (sulfuryl fluoride) or 100% of the MCL (fluoride anion). HED is generally concerned when estimated cancer risk exceeds one in one million (i.e., the risk exceeds  $1 \times 10^{-6}$ ). References which discuss the acute and chronic risk assessments in more detail are available on the EPA/pesticides web site: "Available Information on Assessing Exposure from Pesticides, A User's Guide," 6/21/2000, web link: <http://www.epa.gov/fedrgstr/EPA-PEST/2000/July/Day-12/6061.pdf>; or see SOP 99.6 (8/20/99).

The most recent dietary risk assessment for sulfuryl fluoride and fluoride anion were conducted as part of an Experimental Use Permit evaluation (M. Doherty, D275230, 6/13/2001).

## **II. Residue Information**

*Sulfuryl fluoride.* Average residue values from residue trials conducted in fumigation chambers and grain processing mills were used for both parent sulfuryl fluoride and fluoride anion. These residues are summarized in the Summary of Analytical Chemistry and Residue Data for sulfuryl fluoride (M. Doherty, D283007, 1/13/04). These residues are presented in Table 1, which also includes the percent market share estimates that were used in the assessment (Memo from John Faulkner, BEAD to Dennis McNeilly, RD; D283699, 10/28/02). Overall, these data should be considered to be moderately refined estimates of residues.

A 0.1X processing factor has been used for flour commodities to account for the practice of drawing down the grain in the mill prior to fumigation and then flushing any residual grain/flour out of the mill with fresh grain during startup and mill equilibration. This is

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essentially a dilution situation and the 0.1X factor is reasonable based on standard practices. This factor has been incorporated into the residue estimate for fluoride (Table 2) since grains entering the processing facility may have been treated with sufluryl fluoride. The potentially elevated fluoride level in the grain was added to the average residue for treated flour multiplied by the drawdown factor. The contribution from potentially treated grain was estimated by multiplying the average residues in grain by the empirical processing factors of either 0.38 (wheat) or 0.73 (all other grains). Thus, the estimated residue in flour may be expressed as:

$$(\text{Avg. Grain Residue} \times \text{Processing Factor}) + (\text{Avg. Flour Residue} \times \text{Drawdown Factor}).$$

For all other commodities, the DEEM-FCID default processing factor of 1 was used since the use of sulfuryl fluoride would result in the direct treatment of processed commodities. Where residue data for a specific food item were not available, translations were made based on HED SOP 2000.1 (Guidance for Translation of Field Trial Data from Representative Commodities in the Crop Group Regulation to Other Commodities in Each Crop Group/Subgroup, 9/12/2000). For foods not covered by SOP 2000.1, translations were made from similar foods or food types and the highest residues were assumed when multiple similar commodities were available. Overall, these should be considered to be moderately refined estimates of residues.

Food	Sulfuryl Fluoride, ppm	Proc. Factor	Est. Crop Treated, %	Remarks
Almond	0.03	1	20	—
Almond-babyfood	0.03	1	20	—
Almond, oil	0.03	1	20	—
Almond, oil-babyfood	0.03	1	20	—
Apple, dried	0.037	1	40	From Figs
Apple, dried-babyfood	0.037	1	40	From Figs
Apricot, dried	0.037	1	40	From Figs
Banana, dried	0.037	1	40	From Figs
Banana, dried-babyfood	0.037	1	40	From Figs
Barley, pearled barley	0.02	1	2	From Corn
Barley, pearled barley-babyfood	0.02	1	2	From Corn
Barley, flour	0.02	0.1	2	From Corn (0.1 is a drawdown factor)
Barley, flour-babyfood	0.02	0.1	2	From Corn (0.1 is a drawdown factor)
Barley, bran	0.02	1	2	From Corn
Brazil nut	2.4	1	20	From Pecan
Butternut	2.4	1	20	From Pecan
Cashew	2.4	1	20	From Pecan
Chestnut	2.4	1	20	From Pecan
Coconut, dried	0.037	1	40	From Figs
Corn, field, flour	0.02	0.1	2	0.1 is a drawdown factor
Corn, field, flour-babyfood	0.02	0.1	2	0.1 is a drawdown factor
Corn, field, meal	0.02	1	2	—
Corn, field, meal-babyfood	0.02	1	2	—

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Food	Sulfuryl Fluoride, ppm	Proc. Factor	Est. Crop Treated, %	Remarks
Corn, field, bran	0.02	1	2	—
Corn, field, starch	0.02	1	2	—
Corn, field, starch-babyfood	0.02	1	2	—
Cranberry, dried	0.037	1	40	From Figs
Fig, dried	0.037	1	40	—
Filbert	2.4	1	20	From Pecan
Filbert, oil	2.4	1	20	From Pecan
Grape, raisin	0.001	1	40	—
Hickory nut	2.4	1	20	From Pecan
Lychee, dried	0.037	1	40	From Figs
Macadamia nut	2.4	1	20	From Pecan
Mango, dried	0.037	1	40	From Figs
Oat, bran	0.008	1	2	From Wheat
Oat, flour	0.008	0.1	2	From Wheat (0.1 is a drawdown factor)
Oat, flour-babyfood	0.008	0.1	2	From Wheat (0.1 is a drawdown factor)
Oat, groats/rolled oats	0.008	1	2	From Wheat
Oat, groats/rolled oats-babyfood	0.008	1	2	From Wheat
Papaya, dried	0.037	1	40	From Figs
Peach, dried	0.037	1	40	From Figs
Peach, dried-babyfood	0.037	1	40	From Figs
Pear, dried	0.037	1	40	From Figs
Pecan	2.4	1	20	—
Pineapple, dried	0.037	1	40	From Figs
Pistachio	0.3	1	20	—
Plantain, dried	0.037	1	40	From Figs
Plum, prune, dried	0.001	1	40	—
Plum, prune, dried-babyfood	0.001	1	40	—
Rice, white	0.008	1	2	—
Rice, white-babyfood	0.008	1	2	—
Rice, brown	0.021	1	2	—
Rice, brown-babyfood	0.021	1	2	—
Rice, flour	0.021	0.1	2	Translated from brown rice (0.1 drawdown factor)
Rice, flour-babyfood	0.021	0.1	2	Translated from brown rice (0.1 drawdown factor)
Rice, bran	0.008	1	2	—
Rice, bran-babyfood	0.008	1	2	—
Walnut	0.6	1	20	—
Wheat, grain	0.09	1	2	—
Wheat, grain-babyfood	0.09	1	2	—
Wheat, flour	0.008	0.1	2	0.1 is a drawdown factor
Wheat, flour-babyfood	0.008	0.1	2	0.1 is a drawdown factor
Wheat, germ	0.02	1	2	—
Wheat, bran	0.008	1	2	—

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Table 2. Average Residue Values of Fluoride Anion Resulting from the Requested Uses of Sulfuryl Fluoride, and Percent Crop Treated Estimates Used in the Chronic Dietary Exposure Assessment.

Food	Fluoride Anion, ppm	Proc. Factor	Est. Crop Treated, %	Remarks
Almond	4.7	1	20	—
Almond-babyfood	4.7	1	20	—
Almond, oil	1.2	1	20	—
Almond, oil-babyfood	1.2	1	20	—
Apple, dried	1.2	1	40	—
Apple, dried-babyfood	1.2	1	40	—
Apricot, dried	1.2	1	40	—
Banana, dried	1.2	1	40	—
Banana, dried-babyfood	1.2	1	40	—
Barley, pearled barley	50	1	2	Xlated: grain x 5 (wheat/corn)
Barley, pearled barley-babyfood	50	1	2	Xlated: grain x 5 (wheat/corn)
Barley, flour	9.58	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Barley, flour-babyfood	9.58	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Barley, bran	50	1	2	Xlated: grain x 5 (wheat/corn)
Brazil nut	8.6	1	20	From Pecan
Butternut	8.6	1	20	From Pecan
Cashew	8.6	1	20	From Pecan
Chestnut	8.6	1	20	From Pecan
Coconut, dried	1.2	1	40	—
Corn, field, flour	4.11	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Corn, field, flour-babyfood	4.11	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Corn, field, meal	24	1	2	—
Corn, field, meal-babyfood	24	1	2	—
Corn, field, bran	24	1	2	Translated from meal
Corn, field, starch	4.6	1	2	—
Corn, field, starch-babyfood	4.6	1	2	—
Cranberry, dried	1.2	1	40	—
Fig, dried	1.2	1	40	—
Filbert	8.6	1	20	From Pecan
Filbert, oil	1.2	1	20	—
Grape, raisin	1.2	1	40	—
Hickory nut	8.6	1	20	From Pecan
Lychee, dried	1.2	1	40	—
Macadamia nut	8.6	1	20	From Pecan
Mango, dried	1.2	1	40	—
Oat, bran	50	1	2	Xlated: grain x 5 (wheat/corn)
Oat, flour	12.14	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Oat, flour-babyfood	12.14	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Oat, groats/rolled oats	50	1	2	Xlated: grain x 5 (wheat/corn)

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Food	Fluoride Anion, ppm	Proc. Factor	Est. Crop Treated, %	Remarks
Oat, groats/rolled oats-babyfood	50	1	2	Xlated: grain x 5 (wheat/corn)
Papaya, dried	1.2	1	40	—
Peach, dried	1.2	1	40	—
Peach, dried-babyfood	1.2	1	40	—
Pear, dried	1.2	1	40	—
Pecan	8.6	1	20	—
Pineapple, dried	1.2	1	40	—
Pistachio	4.1	1	20	—
Plantain, dried	1.2	1	40	—
Plum, prune, dried	0.7	1	40	—
Plum, prune, dried-babyfood	0.7	1	40	—
Rice, white	5	1	2	—
Rice, white-babyfood	5	1	2	—
Rice, brown	5.3	1	2	—
Rice, brown-babyfood	5.3	1	2	—
Rice, flour	7.24	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Rice, flour-babyfood	7.24	1	2	(Avg. grain residue*0.73 PF)+(Avg. flour*0.1 DF)
Rice, bran	25.9	1	2	—
Rice, bran-babyfood	25.9	1	2	—
Walnut	5.6	1	20	—
Wheat, grain	4	1	2	—
Wheat, grain-babyfood	4	1	2	—
Wheat, flour	4.99	1	2	(Avg. grain residue*0.38 PF)+(Avg. flour*0.1 DF)
Wheat, flour-babyfood	4.99	1	2	(Avg. grain residue*0.38 PF)+(Avg. flour*0.1 DF)
Wheat, germ	58	1	2	—
Wheat, bran	35.95	1	2	—

*Cryolite.* In evaluating the exposure to fluoride from the agricultural uses of cryolite, residue trial data were matched as closely as possible to the current maximum use patterns for this active ingredient. Where there were discrepancies between the use pattern and the residue trial data, worst-case assumptions were made regarding residue levels. Translations to commodities for which direct residue data were not available were based on HED SOP 2000.1. Residue values and percent crop treated estimates are summarized in Table 3. Empirically derived processing factors were used for processed commodities of grapes, citrus, mint, and tomato. Default processing factors from DEEM Version 7.81 were used for all other commodities. Overall, these should be considered to be moderately refined estimates of residues.



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Table 3. Average Residue Values of Fluoride Anion Resulting from the Uses of Cryolite, and Percent Crop Treated Estimates Used in the Chronic Dietary Exposure Assessment.

Food	Fluoride Anion, ppm	Proc. Factor	Est. Crop Treated, %	Remarks
Apricot	4.5	1	1	From Peach
Apricot-babyfood	4.5	1	1	From Peach
Apricot, dried	4.5	6	1	From Peach
Apricot, juice	4.5	1	1	From Peach
Apricot, juice-babyfood	4.5	1	1	From Peach
Blackberry	0.25	1	100	From Raspberry
Blackberry, juice	0.25	1	100	From Raspberry
Blackberry, juice-babyfood	0.25	1	100	From Raspberry
Blueberry	0.11	1	100	MRID 44742401
Blueberry-babyfood	0.11	1	100	MRID 44742402
Boysenberry	0.25	1	100	From Raspberry
Broccoli	5	1	2	MRID 00158001
Broccoli-babyfood	5	1	2	MRID 00158001
Brussels sprouts	4	1	2	MRID 00158001
Cabbage	1.5	1	1	MRID 41380610
Cabbage, Chinese, bok choy	4	1	1	MRID 00158001
Cantaloupe	2.16	1	1	MRID 41380602
Casaba	2.16	1	1	From Cantaloupe
Cauliflower	3	1	2	MRID 00158001
Citrus citron	8	1	4	From Orange
Collards	4	1	2	MRID 41380601
Cranberry	0.5	1	100	D231384
Cranberry-babyfood	0.5	1	100	D231384
Cranberry, dried	0.5	1	100	D231384
Cranberry, juice	0.5	1.1	100	D231384
Cranberry, juice-babyfood	0.5	1.1	100	D231384
Cucumber	2.5	1	1	MRID 43867501
Currant	0.11	1	100	From Blueberry
Currant, dried	0.11	1	100	From Blueberry
Dewberry	0.25	1	100	From Raspberry
Eggplant	1.5	1	1	From Tomato
Elderberry	0.11	1	100	From Blueberry
Gooseberry	0.11	1	100	From Blueberry
Grape	3.5	1	33	MRID 00158001
Grape, juice	3.5	0.83	33	MRID 00158001+470178022
Grape, juice-babyfood	3.5	0.83	33	MRID 00158001+470178022
Grape, leaves	3.5	1	33	MRID 00158001
Grape, raisin	3.5	0.3	33	MRID 00158001+470178022
Grape, wine and sherry	3.5	0.83	33	MRID 00158001
Grapefruit	9	1	4	MRID 41380604+42751710
Grapefruit, juice	9	0.026	4	MRID 41380604+42751710+41380607
Honeydew melon	2.16	1	1	From Cantaloupe
Huckleberry	0.11	1	100	From Blueberry
Kale	4	1	2	From Collards
Kiwifruit	4.5	1	14	MRID 40635601
Kohlrabi	5	1	2	From Broccoli
Kumquat	8	1	4	From Orange

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Food	Fluoride Anion, ppm	Proc. Factor	Est. Crop Treated, %	Remarks
Lemon	13.5	1	2	MRID 41380605
Lemon, juice	13.5	0.024	2	MRID 41380605+41380607
Lemon, juice-babyfood	13.5	0.024	2	MRID 41380605+41380607
Lemon, peel	13.5	0.28	2	MRID 41380605
Lettuce, head	2.5	1	1	MRID 00158001+41380611
Lettuce, leaf	15	1	1	MRID 00158001+41380611+40901303
Lime	13.5	1	4	From Lemon
Lime, juice	13.5	0.024	4	From Lemon
Lime, juice-babyfood	13.5	0.024	4	From Lemon
Loganberry	0.25	1	100	From Raspberry
Nectarine	4.5	1	1	From Peach
Orange	8	1	2	MRID 41380606
Orange, juice	8	0.022	2	MRID 41380606+41380607
Orange, juice-babyfood	8	0.022	2	MRID 41380606+41380607
Orange, peel	8	0.28	2	MRID 41380606
Peach	4.5	1	1	MRID 43077601
Peach-babyfood	4.5	1	1	MRID 43077601
Peach, dried	4.5	7	1	MRID 43077601
Peach, dried-babyfood	4.5	7	1	MRID 43077601
Peach, juice	4.5	1	1	MRID 43077601
Peach, juice-babyfood	4.5	1	1	MRID 43077601
Pepper, bell	3.5	1	1	MRID 42659301
Pepper, bell-babyfood	3.5	1	1	MRID 42659301
Pepper, bell, dried	3.5	1	1	MRID 42659301
Pepper, bell, dried-babyfood	3.5	1	1	MRID 42659301
Pepper, nonbell	3.5	1	1	MRID 42659301
Pepper, nonbell-babyfood	3.5	1	1	MRID 42659301
Pepper, nonbell, dried	3.5	1	1	MRID 42659301
Peppermint	19.5	1	100	MRID 45113801
Peppermint, oil	19.5	0.026	100	D276350
Plum	0.5	1	1	MRID 43830201
Plum-babyfood	0.5	1	1	MRID 43830201
Plum, prune, fresh	2	1	1	MRID 43830201, 4X factor
Plum, prune, fresh-babyfood	2	1	1	MRID 43830201
Plum, prune, dried	2	5	1	MRID 43830201
Plum, prune, dried-babyfood	2	5	1	MRID 43830201
Plum, prune, juice	2	1.4	1	MRID 43830201
Plum, prune, juice-babyfood	2	1.4	1	MRID 43830201
Potato, chips	0.65	1	3	MRID 42067901
Potato, dry (granules/ flakes)	0.65	6.5	3	MRID 42067901
Potato, dry (granules/ flakes)-babyfood	0.65	6.5	3	MRID 42067901
Potato, flour	0.65	6.5	3	MRID 42067901
Potato, flour-babyfood	0.65	6.5	3	MRID 42067901
Potato, tuber, w/peel	0.65	1	3	MRID 42067901
Potato, tuber, w/peel-babyfood	0.65	1	3	MRID 42067901
Potato, tuber, w/o peel	0.65	1	3	MRID 42067901
Potato, tuber, w/o peel-babyfood	0.65	1	3	MRID 42067901
Pummelo	9	1	4	From Grapefruit
Pumpkin	2.5	1	1	MRID 00158001

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Pumpkin, seed	2.5	1	1	MRID 00158001
Raspberry	0.25	1	100	MRID 45162301
Raspberry-babyfood	0.25	1	100	MRID 45162301
Raspberry, juice	0.25	1	100	MRID 45162301
Raspberry, juice-babyfood	0.25	1	100	MRID 45162301
Spearmint	19.5	1	100	MRID 45113801
Spearmint, oil	19.5	0.026	100	D276350
Squash, summer	2.5	1	1	MRID 41380603
Squash, summer-babyfood	2.5	1	1	MRID 41380603
Squash, winter	2.5	1	1	From Summer Squash
Squash, winter-babyfood	2.5	1	1	From Summer Squash
Strawberry	1	1	2	MRID 45009001
Strawberry-babyfood	1	1	2	MRID 45009001
Strawberry, juice	1	1	2	MRID 45009001
Strawberry, juice-babyfood	1	1	2	MRID 45009001
Tangerine	8	1	4	From Orange
Tangerine, juice	8	0.028	4	From Orange
Tomato	1.5	1	1	MRID 42656901+41380608
Tomato-babyfood	1.5	1	1	MRID 42656901+41380608
Tomato, paste	1.5	1.5	1	MRID 42656901+41380608+41380609
Tomato, paste-babyfood	1.5	1.5	1	MRID 42656901+41380608+41380609
Tomato, puree	1.5	1	1	MRID 42656901+41380608+41380609
Tomato, puree-babyfood	1.5	1	1	MRID 42656901+41380608+41380609
Tomato, dried	1.5	14.3	1	MRID 42656901+41380608
Tomato, dried-babyfood	1.5	14.3	1	MRID 42656901+41380608
Tomato, juice	1.5	1.5	1	MRID 42656901+41380608+41380609
Watermelon	2.16	1	1	From Cantaloupe
Watermelon, juice	2.16	1	1	From Cantaloupe

*Background Fluoride in Foods.* Monitoring studies indicate fluoride is ubiquitous in the food supply (e.g., World Health Organization. 2002; Rao, G. S. 1984; Sherlock, JC. 1984). The primary sources for residues used in this background food assessment were Taves, D.R. (1983) for plant-based foods, bovine and porcine commodities, and eggs; Fein, N.J. and Cerklewski F.L. (2001) for poultry; and residue trials for tree nuts and dried fruits (MRID 45510304). Average residue values were used when available. In cases where a range was listed, the high value in the range was used. When a specific food in the DEEM-FCID input listing was not addressed by one of the monitoring studies, residues were translated from similar commodities using HED SOP 2000.1. In the 1983 study by Taves, 93 food items from a hospital in an area with fluoridated water were analyzed for fluoride content. The use of the Taves data accounts for the increase in fluoride residues that may occur when foods are processed/prepared in fluoridated water. In cases where there was uncertainty about the most appropriate translation to use, the maximum residue from the Taves data (beans cooked in fluoridated water) was used. Due to the inclusion

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of fluoride residues for all of the food items in DEEM-FCID (543 entries), the residue values are listed only in Attachment 4 and not as a separate table within the body of this document. Note that the residue estimates for dried fruits and tree nuts are at  $\frac{1}{2}$  the LOQ for the residue trial method and are most likely overestimates of fluoride, based on the residue levels in other commodities. Overall, these should be considered to be conservative to slightly refined estimates of fluoride residues.

*Fluoride in Water.* Monitoring data for the U.S. from 1983 to 1998 (U.S. EPA, 2003) indicate that approximately 99% of the U.S. population is supplied with water containing less than 2 ppm fluoride anion (Figure 1), and this assessment has assumed a residue level of 2 ppm for tap water. For water sources other than tap water, this assessment has used a residue level of 0.4 ppm, which is the median value from the above-cited monitoring data. Typically, refined chronic dietary assessments rely on central tendency (e.g., mean or median) residue values, as was assumed for non-tap water. HED believes that the use of the 99<sup>th</sup> percentile residue value is appropriate for tap water because of the likelihood that a given individual will obtain their tap water from a relatively consistent source for long periods of time.

Residue input files for the dietary analyses are included as Attachments 1-5.

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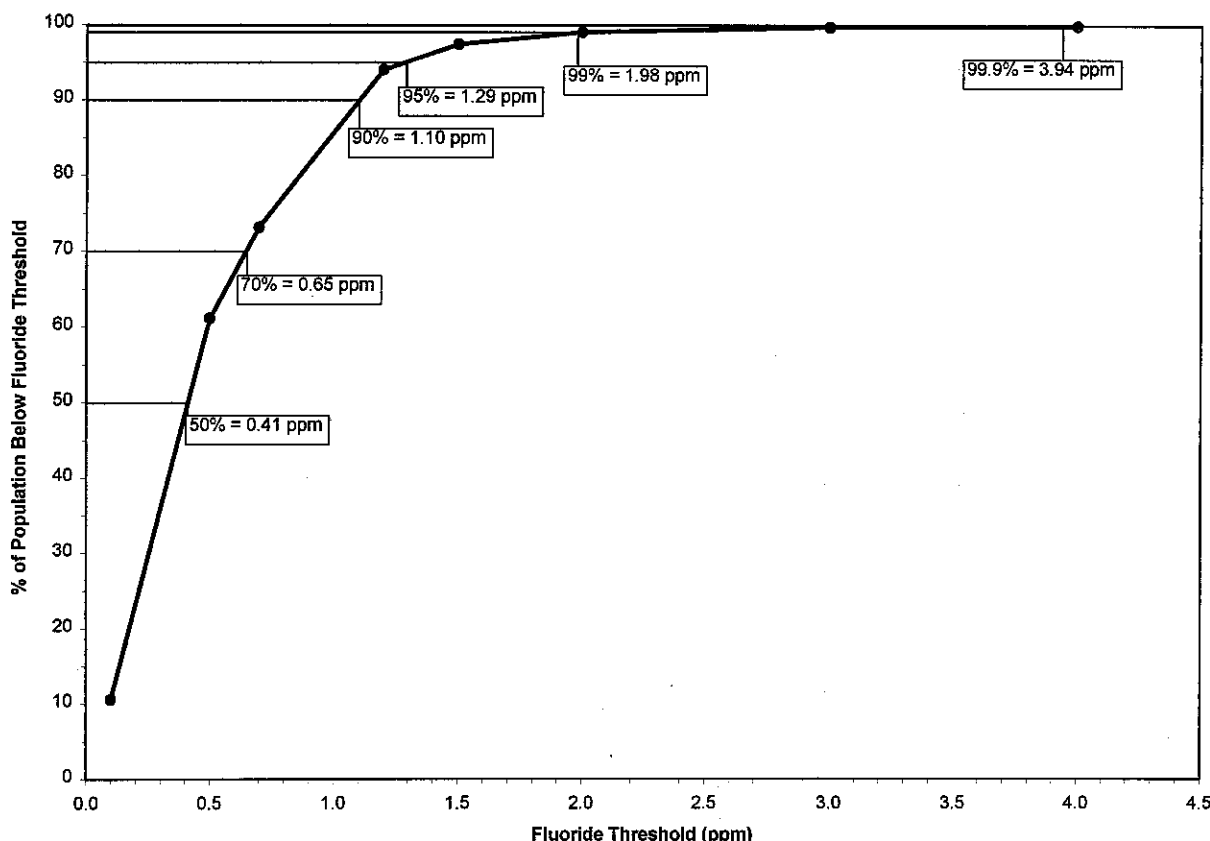


Figure 1. Cumulative Distribution of Fluoride Concentrations in Drinking Water for the U.S. Population (1986 - 1998). Derived from *Occurrence Estimation Methodology and Occurrence Findings Report for the Six-Year Review of Existing National Primary Drinking Water Regulations*. U.S. EPA. 2003. Office of Water EPA-815-R-03-006. Washington, DC.

### III. DEEM-FCID™ Program and Consumption Information

Sulfuryl fluoride and fluoride anion chronic dietary exposure assessments were conducted using the Dietary Exposure Evaluation Model software with the Food Commodity Intake Database (DEEM-FCID™, Version 1.30), which incorporates consumption data from USDA's Continuing Surveys of Food Intakes by Individuals (CSFII), 1994-1996 and 1998. The 1994-96, 98 data are based on the reported consumption of more than 20,000 individuals over two non-consecutive survey days. Foods "as consumed" (e.g., apple pie) are linked to EPA-defined food commodities (e.g. apples, peeled fruit - cooked; fresh or N/S; baked; or wheat flour - cooked; fresh or N/S, baked) using publicly available recipe translation files developed jointly by USDA/ARS and EPA. For chronic exposure assessments, consumption data are averaged for the entire U.S. population and within population subgroups. Based on analysis of the 1994-96, 98 CSFII consumption data, which took into account dietary patterns and survey respondents, HED

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concluded that it is most appropriate to report risk for the following population subgroups: the general U.S. population, all infants (<1 year old), children 1-2, children 3-5, children 6-12, youth 13-19, adults 20-49, females 13-49, and adults 50+ years old.

For chronic dietary exposure assessment, an estimate of the residue level in each food or food-form (e.g., orange or orange juice) on the food commodity residue list is multiplied by the average daily consumption estimate for that food/food form. The resulting residue consumption estimate for each food/food form is summed with the residue consumption estimates for all other food/food forms on the commodity residue list to arrive at the total average estimated exposure. Exposure is expressed in mg/kg body weight/day and as a percent of a toxicologically relevant dose (generally a PAD). This procedure is performed for each population subgroup.

HED notes that the FCID recipe translations do not include commercial water as an ingredient for any processed beverages. Therefore, in conducting its assessment for fluoride in water, HED has used DEEM version 7.87. That version of the software uses Novigen's proprietary recipe files which do include commercial water. For purposes of comparison, the results of a DEEM-FCID analysis are included as Attachment 11.

#### IV. Toxicological Information

*Sulfuryl Fluoride.* On October 21, 2003, HED's Hazard Identification Assessment Review Committee (HIARC) met to re-evaluate the potential for increased susceptibility of infants and children from exposure to sulfuryl fluoride, as required by the Food Quality Protection Act (FQPA) of 1996, according to the 2002 OPP 10X Guidance Document. This re-evaluation was conducted to update the decision which was reached on April 11, 2001 using previous OPP policy. The findings of those meetings, as related to dietary exposure, are summarized in Table 4. Sulfuryl fluoride is classified as a "not likely" human carcinogen according to the EPA Draft Guidelines for Carcinogen Risk Assessment dated July, 1999; therefore, a cancer assessment is not necessary.

Table 4. Summary of Dose and Endpoint Selection Relevant for use in Dietary Human Health Risk Assessments for Sulfuryl Fluoride. Kidwell, J. TXR No. 0052208. 10/31/03. Sulfuryl Fluoride - Second Report of the Hazard Identification Assessment Review Committee.			
Exposure Scenario	Dose Used in Risk Assessment, UF	Special FQPA SF and Level of Concern for Risk Assessment	Study and Toxicological Effects
Acute Dietary	None UF = N/A	Not applicable	No toxicological endpoint attributable to a single exposure was identified in the available toxicology studies on sulfuryl fluoride.

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Table 4. Summary of Dose and Endpoint Selection Relevant for use in Dietary Human Health Risk Assessments for Sulfuryl Fluoride. Kidwell, J. TXR No. 0052208. 10/31/03. Sulfuryl Fluoride - Second Report of the Hazard Identification Assessment Review Committee.

Exposure Scenario	Dose Used in Risk Assessment, UF	Special FQPA SF and Level of Concern for Risk Assessment	Study and Toxicological Effects
Chronic Dietary (All populations)	NOAEL = 8.5 mg/kg/day UF = 3000 <b>Chronic RfD = 0.003 mg/kg/day</b>	FQPA SF = 1X <b>cPAD = chronic RfD</b> FQPA SF = <b>0.003 mg/kg/day</b>	<b>90-Day Inhalation - Rabbit</b> LOAEL = 28 mg/kg/day based on vacuolation of white matter in the brain of females.
Cancer	Classified as "Not likely to be carcinogenic to humans"		

UF = uncertainty factor, FQPA SF = Special FQPA safety factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, PAD = population adjusted dose (a = acute, c = chronic) RfD = reference dose

**Fluoride.** HED is basing its fluoride risk assessments on the primary and secondary MCLs for fluoride set by the Agency's Office of Water. In regulating fluoride levels in water, the Office of Water has determined that the primary MCL of 4 ppm provides adequate protection against skeletal fluorosis, which is the primary effect of concern (50 FR 47142). HED has converted the MCL from units of parts per million to mg/kg/day using the NHANES body weight and water consumption estimates shown in Table 5.:

Table 5. Conversion of the Skeletal Fluorosis MCL of 4 ppm for use in the Fluoride Risk Assessments. The doses are used in a manner analogous to an RfD and are used for all exposure pathways.

Population Subgroup	Toxicological Effect	Water Conc. Protective of Effect, ppm	Water Consumption, L/day	Body Weight, kg	Toxicological Dose, mg/kg/day
U.S. Population (total)	Skeletal Fluorosis	4	2	70	0.114
All infants (< 1 year)	Skeletal Fluorosis	4	1	7	0.571
Children 1-2 yrs	Skeletal Fluorosis	4	1	13	0.308
Children 3-5 yrs	Skeletal Fluorosis	4	1	22	0.182
Children 6-12 yrs	Skeletal Fluorosis	4	1	40	0.100
Youth 13-19 yrs	Skeletal Fluorosis	4	2	60	0.133
Adults 20+ yrs	Skeletal Fluorosis	4	2	70	0.114
Females 13-49 yrs	Skeletal Fluorosis	4	2	61	0.131

## V. Results/Discussion

The results reported in Tables 6-10 summarize the exposure and risk estimates for sulfuryl fluoride and the various dietary fluoride anion exposure routes addressed by these assessments. The results are for the general U.S. Population, all infants (<1 year old), children 1-2, children 3-5, children 6-12, youth 13-19, females 13-49, adults 20-49, and adults 50+ years.

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Table 6. Results of the Refined Chronic Dietary Exposure Assessment for Sulfuryl Fluoride.			
Population Subgroup	Chronic PAD, mg/kg/day	Estimated Exposure, mg/kg/day	Risk, % of cPAD
U.S. Population (total)	0.003	0.000003	<1
All infants (< 1 year)	0.003	0.000002	<1
Children 1-2 yrs	0.003	0.000004	<1
Children 3-5 yrs	0.003	0.000004	<1
Children 6-12 yrs	0.003	0.000003	<1
Youth 13-19 yrs	0.003	0.000001	<1
Adults 20-49 yrs	0.003	0.000003	<1
Adults 50+ yrs	0.003	0.000004	<1
Females 13-49 yrs	0.003	0.000003	<1

Table 7. Results of the Refined Chronic Dietary Exposure Assessment for Fluoride Anion from Use of Sulfuryl Fluoride.			
Population Subgroup	Toxicological Dose, mg/kg/day	Estimated Exposure, mg/kg/day	Risk, % of MCL
U.S. Population (total)	0.114	0.000441	<1
All infants (< 1 year)	0.571	0.000533	<1
Children 1-2 yrs	0.308	0.001328	<1
Children 3-5 yrs	0.182	0.001191	1
Children 6-12 yrs	0.100	0.000728	1
Youth 13-19 yrs	0.133	0.000389	<1
Adults 20-49 yrs	0.114	0.000323	<1
Adults 50+ yrs	0.114	0.000301	<1
Females 13-49 yrs	0.131	0.000300	<1



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Table 8. Results of the Refined Chronic Dietary Exposure Assessment for Fluoride Anion from Use of Cryolite.			
Population Subgroup	Toxicological Dose, mg/kg/day	Estimated Exposure, mg/kg/day	Risk, % of MCL
U.S. Population (total)	0.114	0.000648	<1
All infants (< 1 year)	0.571	0.000945	<1
Children 1-2 yrs	0.308	0.003105	1
Children 3-5 yrs	0.182	0.002008	1
Children 6-12 yrs	0.100	0.000848	1
Youth 13-19 yrs	0.133	0.000324	<1
Adults 20-49 yrs	0.114	0.000424	<1
Adults 50+ yrs	0.114	0.000517	<1
Females 13-49 yrs	0.131	0.000452	<1

Table 9. Results of the Refined Chronic Dietary Exposure Assessment for Fluoride Anion from Background Levels in Food.			
Population Subgroup	Toxicological Dose, mg/kg/day	Estimated Exposure, mg/kg/day	Risk, % of MCL
U.S. Population (total)	0.114	0.006825	6
All infants (< 1 year)	0.571	0.009266	2
Children 1-2 yrs	0.308	0.017457	6
Children 3-5 yrs	0.182	0.014939	8
Children 6-12 yrs	0.100	0.009419	9
Youth 13-19 yrs	0.133	0.006206	5
Adults 20-49 yrs	0.114	0.005712	5
Adults 50+ yrs	0.114	0.005027	4
Females 13-49 yrs	0.131	0.005358	4

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Table 10. Results of the Refined Chronic Dietary Exposure Assessment for Fluoride Anion from Water. Note: Results are from DEEM 7.87

Population Subgroup	Toxicological Dose, mg/kg/day	Estimated Exposure, mg/kg/day	Risk, % of MCL
U.S. Population (total)	0.114	0.026879	24
All infants (< 1 year)	0.571	0.142449	25
Children 1-2 yrs	0.308	0.040671	13
Children 3-5 yrs	0.182	0.033816	19
Children 6-12 yrs	0.100	0.022657	23
Youth 13-19 yrs	0.133	0.017613	13
Adults 20-49 yrs	0.114	0.025176	22
Adults 50+ yrs	0.114	0.025630	22
Females 13-49 yrs	0.131	0.023843	18

Note: For the water assessment, the subgroup non-nursing infants has the highest estimated exposure. That group is not considered to be one of the representative subgroups within the CSFII consumption database and, therefore, has not been included in the body of Table 10. The exposure estimate for Non-nursing infants is 0.177693 mg/kg/day. This corresponds to a risk of 31% of the MCL.

Table 11. Total Exposure and Risk Estimates for Fluoride from Dietary Sources.

Population Subgroup	Tox. Dose, mg/kg/day	Dietary Fluoride Anion Exposure Estimates, mg/kg/day					Risk, % of MCL
		Sulfuryl Fluoride	Cryolite	Background Food	Water	Total	
U.S. Population (total)	0.114	0.0004	0.0006	0.0068	0.0269	0.0348	31
All infants (< 1 year)	0.571	0.0005	0.0009	0.0093	0.1424	0.1532	27
Children 1-2 yrs	0.308	0.0013	0.0031	0.0175	0.0407	0.0626	20
Children 3-5 yrs	0.182	0.0012	0.0020	0.0149	0.0338	0.0520	29
Children 6-12 yrs	0.100	0.0007	0.0008	0.0094	0.0227	0.0337	34
Youth 13-19 yrs	0.133	0.0004	0.0003	0.0062	0.0176	0.0245	18
Adults 20-49 yrs	0.114	0.0003	0.0004	0.0057	0.0252	0.0316	28
Adults 50+ yrs	0.114	0.0003	0.0005	0.0050	0.0256	0.0315	28
Females 13-49 yrs	0.131	0.0003	0.0005	0.0054	0.0238	0.0300	23

As shown in Tables 6 through 10, the risk estimates for both sulfuryl fluoride and individual sources of fluoride anion are below HED's level of concern for all population subgroups. Table 11 shows the estimated combined fluoride exposure from sources addressed by these dietary assessments. In addition to showing the combined dietary fluoride exposure estimate, Table 11 illustrates the relative contributions of the various sources to dietary fluoride exposure. Based on the inputs for these analyses, fluoride from water is the primary contributor to dietary fluoride exposure, with exposure to background levels of fluoride in food being approximately 2 - 16 times less than that from water. The fluoride exposures resulting from the

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uses of cryolite and sulfuryl fluoride each are 4-9 times less than that coming from food and 13-360 times less than that from water. Overall, the combined dietary fluoride risk estimates are below HED's level of concern for all population subgroups.

## **VI. Characterization of Inputs/Outputs**

Toxicological and residue chemistry data associated with sulfuryl fluoride are reasonably well understood. The use of average sulfuryl fluoride residues and percent projected market share estimates result in a moderately refined assessment relative to actual, expected residues and market share values. Residue estimates are based on maximum use rates. Sulfuryl fluoride is efficacious at lower rates, and the maximum rates are likely to be used only in the most extreme pest-control situations (Bruce Houtman, Dow AgroSciences, pers. comm.). As noted in the projected market share analysis (Attachment 12), the estimated values are described as being conservatively high.

Relative to the sulfuryl fluoride database, there are more uncertainties associated with the fluoride toxicology and residue estimates, especially background levels in food and water. Those aspects of the fluoride assessments are discussed below.

*Residue Data - Food.* Residue data used in this assessment are slightly to moderately refined. Average values were used when available, in keeping with the chronic nature of the exposure scenarios being evaluated. When average values were not available, maximum values from the available range of numbers were used. The use of these maximum values and use of worst-case assumptions when translating between food commodities maintains some conservativeness in the assessment. Furthermore, the use of the residue value for beans cooked in fluoridated water is very likely an extreme overestimate of fluoride residue for a number of commodities.

*Residue Data - Water.* The use of 2 ppm fluoride in tap water and 0.4 ppm in other water sources likely results in an overestimation of exposure for the general population, especially those people using public water systems. However, it may underestimate exposures to certain regional populations in the U.S. who are supplied by well water that is naturally high in fluoride (e.g., western regions of the U.S.). In monitoring data (1991-2002) from the National Water Quality Assessment (NAWQA) Program (<http://water.usgs.gov/nawqa/>), the concentration of fluoride in groundwater samples designated as being used for domestic purposes exceeded 2 ppm in at least one sample from 13 of 49 study units. Examination of data from each of those 13 study units indicates that there is a fair degree of variability in fluoride levels. Similar finding regarding spatial difference in fluoride concentration have been noted in local monitoring studies. For example, data from Lakewood Township, Minnesota show a fluoride concentration of 0.4 ppm in a well located at a similar depth and only a few hundred feet from a well with a fluoride concentration of 14.0 ppm (Hastreiter, et al., 1992). Similar variations in fluoride levels over small geographic areas were noted. Data are not available describing fluoride levels for a specific source over time, and it is unclear whether or not there is temporal, as well as spatial,

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variability in well water fluoride concentrations. If temporal variability is similar in magnitude to the spatial variability, then the 2-ppm estimate for fluoride in tap water is conservative for even those populations living in high-fluoride areas (Table 12).

Table 12. Summary of Fluoride Residues in NAWQA Study Units with Maximum Residue Levels Greater than 2 ppm. Data are from samples marked for domestic use. Data are from 1991 - 2002					
Study Unit ID	n	Minimum F, ppm	Maximum F, ppm	Median F, ppm	Average F, ppm
ALMN	94	0.100	2.200	0.186	0.227
CAZB	78	0.100	7.805	0.600	1.289
EIWA	69	0.066	2.300	0.300	0.462
HDSN	47	0.100	4.600	0.100	0.379
HPGW	135	0.147	7.036	1.222	1.590
KANA	58	0.100	2.523	0.100	0.244
NECB	58	0.088	6.162	0.197	0.614
RIOG	25	0.200	4.600	0.400	0.692
SANT	60	0.100	5.515	0.129	0.508
SCTX	52	0.100	3.900	0.258	0.925
SPLT	34	0.100	3.100	0.700	0.924
USNK	199	0.100	2.800	0.400	0.480
YELL	24	0.377	6.966	0.886	1.599

*Toxicological Information.* HED has relied on the Office of Water's evaluation of the toxicological database for fluoride. The National Academy of Sciences is currently updating the assessment of fluoride at the request of the Office of Water. In response to public comments regarding our consideration of fluoride as part of the Experimental Use Permit assessment for sulfuryl fluoride, HED has evaluated over 100 open-literature publications to determine if there is compelling evidence that the MCL is underestimating fluoride toxicity. HED has concluded that the MCL of 4 ppm for skeletal fluorosis is protective of human health (Delarco, V., 2003; Baetcke, et al., 2003). The National Academy of Sciences review is likely to be completed in 2005. Once the Office of Water has reassessed fluoride, OPP will re-examine its fluoride risk assessments.

*Quantitated Sources of Fluoride Exposure.* In conducting these analyses, exposure to fluoride from fluoride supplements has not been included quantitatively. Fluoride supplements are given in consultation with a health care professional who should evaluate overall fluoride exposure prior to treatment. Therefore, HED believes that fluoride supplements would only be provided to persons who are not at risk of overexposure to fluoride from other sources. HED notes that other, non-dietary sources of fluoride exposure (e.g., dentifrices) will be addressed in the forthcoming human health risk assessment (M. Doherty, D275199, in preparation).

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## VII. Conclusions

Based on these analyses, risks from dietary exposures to sulfuryl fluoride that could result from its proposed uses are below HED's level of concern for the general U.S. population and all population subgroups. Likewise, risks from exposure to fluoride anion in foods and water are below HED's level of concern for the general U.S. population and all population subgroups.

## VIII. References

- Baetcke, K., et al. 2003. U.S. EPA Report by Karl Baetcke, et al. dated October 8, 2003.
- Delarco, V. 2003. U.S. EPA Memorandum from Vicki Dellarco (HED) to Debra Edwards (RD) dated October 1, 2002.
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- Richard J. Hastreiter, R. J., Leppink, H. B., Sundberg, L. B., Knaeble, D. J., Turtle, D. R., Falken, M. C., and Roesch, M. H. 1992. Clinical implications of an investigation into the occurrence and distribution of naturally occurring fluoride. *Journal of the Minnesota Dental Association* May/June 1992:19-23. Available at <http://www.seagrant.umn.edu/groundwater/pdfs/Clinical.pdf>
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- Taves, D.R. Dietary intake of fluoride ashed (total fluoride) v. unashed (inorganic fluoride) analysis of individual foods. *Br. J. Nutr.* **49**:295-301.
- U.S. EPA. 2003. *Occurrence Estimation Methodology and Occurrence Findings Report for the Six-Year Review of Existing National Primary Drinking Water Regulations*. Office of Water EPA-815-R-03-006. Washington, DC.
- World Health Organization. 2002. Fluorides – Environmental Health Criteria 227. Chapter 5. World Health Organization, Geneva.

## IX. List of Attachments

- Attachment 1. Input Values Used in the Chronic Dietary Exposure Analysis of Sulfuryl Fluoride.
- Attachment 2. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from

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the use of Sulfuryl Fluoride.

Attachment 3. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from the use of Cryolite.

Attachment 4. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from Background Residues in Food.

Attachment 5. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from Water.

Attachment 6. Results of the Refined Chronic Dietary Exposure Analysis for Sulfuryl Fluoride.

Attachment 7. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from the Use of Sulfuryl Fluoride.

Attachment 8. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from the Use of Cryolite.

Attachment 9. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from Background Levels in Food.

Attachment 10. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from Water Using DEEM 7.87.

Attachment 11. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from Water Using DEEM-FCID.

Attachment 12. Projected Market Share Analysis for Sulfuryl Fluoride.

cc: D. Soderberg (RRB3), RAB2 Reading File

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## Attachment 1. Input Values Used in the Chronic Dietary Exposure Analysis of Sulfuryl Fluoride.

Filename: C:\My Documents\Chemistry Reviews\DEEM Runs\Sulfuryl Fluoride\078003-SF-AR-Likely CT.R98  
 Chemical: Sulfuryl Fluoride  
 RfD(Chronic): .003 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day  
 RfD(Acute): 0 mg/kg bw/day NOEL(Acute): 0 mg/kg bw/day  
 Date created/last modified: 11-12-2003/08:40:46/8 Program ver. 1.30  
 Comment: RfD is cPAD

EPA Code	Crop Grp	Commodity Name	Def Res (ppm)	Adj. Factors #1	Adj. Factors #2	Comment
14000030	14	Almond	0.030000	1.000	0.200	
14000031	14	Almond-babyfood	0.030000	1.000	0.200	
14000040	14	Almond, oil	0.030000	1.000	0.200	
14000041	14	Almond, oil-babyfood	0.030000	1.000	0.200	
11000090	11	Apple, dried	0.037000	1.000	0.400	From Figs
11000091	11	Apple, dried-babyfood	0.037000	1.000	0.400	From Figs
12000130	12	Apricot, dried	0.037000	1.000	0.400	From Figs
95000240	0	Banana, dried	0.037000	1.000	0.400	From Figs
95000241	0	Banana, dried-babyfood	0.037000	1.000	0.400	From Figs
15000250	15	Barley, pearled barley	0.020000	1.000	0.020	From Corn
15000251	15	Barley, pearled barley-babyfood	0.020000	1.000	0.020	From Corn
15000260	15	Barley, flour	0.020000	0.100	0.020	From Corn
15000261	15	Barley, flour-babyfood	0.020000	0.100	0.020	From Corn
15000270	15	Barley, bran	0.020000	1.000	0.020	From Corn
14000590	14	Brazil nut	2.400000	1.000	0.200	From Pecan
14000680	14	Butternut	2.400000	1.000	0.200	From Pecan
14000810	14	Cashew	2.400000	1.000	0.200	From Pecan
14000920	14	Chestnut	2.400000	1.000	0.200	From Pecan
95001120	0	Coconut, dried	0.037000	1.000	0.400	From Figs
15001200	15	Corn, field, flour	0.020000	0.100	0.020	
15001201	15	Corn, field, flour-babyfood	0.020000	0.100	0.020	
15001210	15	Corn, field, meal	0.020000	1.000	0.020	
15001211	15	Corn, field, meal-babyfood	0.020000	1.000	0.020	
15001220	15	Corn, field, bran	0.020000	1.000	0.020	
15001230	15	Corn, field, starch	0.020000	1.000	0.020	
15001231	15	Corn, field, starch-babyfood	0.020000	1.000	0.020	
95001310	0	Cranberry, dried	0.037000	1.000	0.400	From Figs
95001540	0	Fig, dried	0.037000	1.000	0.400	
14001550	14	Filbert	2.400000	1.000	0.200	From Pecan
14001560	14	Filbert, oil	2.400000	1.000	0.200	From Pecan
95001780	0	Grape, raisin	0.001000	1.000	0.400	
14001850	14	Hickory nut	2.400000	1.000	0.200	From Pecan
95002120	0	Lychee, dried	0.037000	1.000	0.400	From Figs
14002130	14	Macadamia nut	2.400000	1.000	0.200	From Pecan
95002160	0	Mango, dried	0.037000	1.000	0.400	From Figs
15002310	15	Oat, bran	0.008000	1.000	0.020	From Wheat
15002320	15	Oat, flour	0.008000	0.100	0.020	From Wheat
15002321	15	Oat, flour-babyfood	0.008000	0.100	0.020	From Wheat
15002330	15	Oat, groats/rolled oats	0.008000	1.000	0.020	From Wheat
15002331	15	Oat, groats/rolled oats-babyfood	0.008000	1.000	0.020	From Wheat
95002460	0	Papaya, dried	0.037000	1.000	0.400	From Figs
12002610	12	Peach, dried	0.037000	1.000	0.400	From Figs
12002611	12	Peach, dried-babyfood	0.037000	1.000	0.400	From Figs
11002670	11	Pear, dried	0.037000	1.000	0.400	From Figs
14002690	14	Pecan	2.400000	1.000	0.200	
95002800	0	Pineapple, dried	0.037000	1.000	0.400	From Figs
14002820	14	Pistachio	0.300000	1.000	0.200	
95002840	0	Plantain, dried	0.037000	1.000	0.400	From Figs
12002870	12	Plum, prune, dried	0.001000	1.000	0.400	
12002871	12	Plum, prune, dried-babyfood	0.001000	1.000	0.400	
15003230	15	Rice, white	0.008000	1.000	0.020	
15003231	15	Rice, white-babyfood	0.008000	1.000	0.020	
15003240	15	Rice, brown	0.021000	1.000	0.020	
15003241	15	Rice, brown-babyfood	0.021000	1.000	0.020	
15003250	15	Rice, flour	0.021000	0.100	0.020	Translated from bran (0.1 drawdown factor)
15003251	15	Rice, flour-babyfood	0.021000	0.100	0.020	Translated from bran (0.1 drawdown factor)
15003260	15	Rice, bran	0.008000	1.000	0.020	
15003261	15	Rice, bran-babyfood	0.008000	1.000	0.020	

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14003910	14	Walnut	0.600000	1.000	0.200	
15004010	15	Wheat, grain	0.090000	1.000	0.020	
15004011	15	Wheat, grain-babyfood	0.090000	1.000	0.020	
15004020	15	Wheat, flour	0.008000	0.100	0.020	0.1 is a drawdown factor
15004021	15	Wheat, flour-babyfood	0.008000	0.100	0.020	0.1 is a drawdown factor
15004030	15	Wheat, germ	0.020000	1.000	0.020	
15004040	15	Wheat, bran	0.008000	1.000	0.020	



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## Attachment 2. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from the use of Sulfuryl Fluoride.

Filename: C:\My Documents\Chemistry Reviews\DEEM Runs\Sulfuryl Fluoride\078003-F-AR-Likely CT.R98  
 Chemical: Fluoride Anion  
 RfD(Chronic): .114 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day  
 RfD(Acute): 0 mg/kg bw/day NOEL(Acute): 0 mg/kg bw/day  
 Date created/last modified: 11-19-2003/08:49:53/8 Program ver. 1.30  
 Comment: RfD is based on MCL of 4 ppm

EPA Code	Crop Grp	Commodity Name	Def Res (ppm)	Adj.Factors #1	Adj.Factors #2	Comment
14000030	14	Almond	4.700000	1.000	0.200	
14000031	14	Almond-babyfood	4.700000	1.000	0.200	
14000040	14	Almond, oil	1.200000	1.000	0.200	
14000041	14	Almond, oil-babyfood	1.200000	1.000	0.200	
11000090	11	Apple, dried	1.200000	1.000	0.400	
11000091	11	Apple, dried-babyfood	1.200000	1.000	0.400	
12000130	12	Apricot, dried	1.200000	1.000	0.400	
95000240	O	Banana, dried	1.200000	1.000	0.400	
95000241	O	Banana, dried-babyfood	1.200000	1.000	0.400	
15000250	15	Barley, pearled barley	50.000000	1.000	0.020	Xlated: grain times 5
(wheat/corn)						
15000251	15	Barley, pearled barley-babyfood	50.000000	1.000	0.020	Xlated: grain times 5
(wheat/corn)						
15000260	15	Barley, flour	9.580000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15000261	15	Barley, flour-babyfood	9.580000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15000270	15	Barley, bran	50.000000	1.000	0.020	Xlated: grain times 5
(wheat/corn)						
14000590	14	Brazil nut	8.600000	1.000	0.200	From Pecan
14000680	14	Butternut	8.600000	1.000	0.200	From Pecan
14000810	14	Cashew	8.600000	1.000	0.200	From Pecan
14000920	14	Chestnut	8.600000	1.000	0.200	From Pecan
95001120	O	Coconut, dried	1.200000	1.000	0.400	
15001200	15	Corn, field, flour	4.110000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15001201	15	Corn, field, flour-babyfood	4.110000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15001210	15	Corn, field, meal	24.000000	1.000	0.020	
15001211	15	Corn, field, meal-babyfood	24.000000	1.000	0.020	
15001220	15	Corn, field, bran	24.000000	1.000	0.020	Translated from meal
15001230	15	Corn, field, starch	4.600000	1.000	0.020	
15001231	15	Corn, field, starch-babyfood	4.600000	1.000	0.020	
95001310	O	Cranberry, dried	1.200000	1.000	0.400	
95001540	O	Fig, dried	1.200000	1.000	0.400	
14001550	14	Filbert	8.600000	1.000	0.200	From Pecan
14001560	14	Filbert, oil	1.200000	1.000	0.200	
95001780	O	Grape, raisin	1.200000	1.000	0.400	
14001850	14	Hickory nut	8.600000	1.000	0.200	From Pecan
95002120	O	Lychee, dried	1.200000	1.000	0.400	
14002130	14	Macadamia nut	8.600000	1.000	0.200	From Pecan
95002160	O	Mango, dried	1.200000	1.000	0.400	
15002310	15	Oat, bran	50.000000	1.000	0.020	Xlated: grain times 5
(wheat/corn)						
15002320	15	Oat, flour	12.140000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15002321	15	Oat, flour-babyfood	12.140000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15002330	15	Oat, groats/rolled oats	50.000000	1.000	0.020	Xlated: grain times 5
(wheat/corn)						
15002331	15	Oat, groats/rolled oats-babyfood	50.000000	1.000	0.020	Xlated: grain times 5
(wheat/corn)						
95002460	O	Papaya, dried	1.200000	1.000	0.400	
12002610	12	Peach, dried	1.200000	1.000	0.400	
12002611	12	Peach, dried-babyfood	1.200000	1.000	0.400	
11002670	11	Pear, dried	1.200000	1.000	0.400	
14002690	14	Pecan	8.600000	1.000	0.200	
95002800	O	Pineapple, dried	1.200000	1.000	0.400	

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14002820	14	Pistachio	4.100000	1.000	0.200	
95002840	0	Plantain, dried	1.200000	1.000	0.400	
12002870	12	Plum, prune, dried	0.700000	1.000	0.400	
12002871	12	Plum, prune, dried-babyfood	0.700000	1.000	0.400	
15003230	15	Rice, white	5.000000	1.000	0.020	
15003231	15	Rice, white-babyfood	5.000000	1.000	0.020	
15003240	15	Rice, brown	5.300000	1.000	0.020	
15003241	15	Rice, brown-babyfood	5.300000	1.000	0.020	
15003250	15	Rice, flour	7.240000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15003251	15	Rice, flour-babyfood	7.240000	1.000	0.020	(Avg. grain residue*0.73
PF)+(Avg. flour*0.1 DF)						
15003260	15	Rice, bran	25.900000	1.000	0.020	
15003261	15	Rice, bran-babyfood	25.900000	1.000	0.020	
14003910	14	Walnut	5.600000	1.000	0.200	
15004010	15	Wheat, grain	4.000000	1.000	0.020	
15004011	15	Wheat, grain-babyfood	4.000000	1.000	0.020	
15004020	15	Wheat, flour	4.990000	1.000	0.020	(Avg. grain residue*0.38
PF)+(Avg. flour*0.1 DF)						
15004021	15	Wheat, flour-babyfood	4.990000	1.000	0.020	(Avg. grain residue*0.38
PF)+(Avg. flour*0.1 DF)						
15004030	15	Wheat, germ	58.000000	1.000	0.020	
15004040	15	Wheat, bran	35.950000	1.000	0.020	

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### Attachment 3. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from the use of Cryolite.

Filename: E:\Briefcase\Chemistry Reviews\DEEM Runs\Sulfuryl Fluoride\Cryolite-AR-CT.R98  
Chemical: Cryolite  
RfD(Chronic): .114 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day  
RfD(Acute): 0 mg/kg bw/day NOEL(Acute): 0 mg/kg bw/day  
Date created/last modified: 11-19-2003/09:21:44/8 Program ver. 1.30

EPA Code	Crop Grp	Commodity Name	Def Res (ppm)	Adj. Factors #1	Adj. Factors #2	Comment
12000120	12	Apricot	4.500000	1.000	0.010	
12000121	12	Apricot-babyfood	4.500000	1.000	0.010	
12000130	12	Apricot, dried	4.500000	6.000	0.010	
12000140	12	Apricot, juice	4.500000	1.000	0.010	
12000141	12	Apricot, juice-babyfood	4.500000	1.000	0.010	
13010550	13A	Blackberry	0.250000	1.000	1.000	
13010560	13A	Blackberry, juice	0.250000	1.000	1.000	
13010561	13A	Blackberry, juice-babyfood	0.250000	1.000	1.000	
13020570	13B	Blueberry	0.110000	1.000	1.000	
13020571	13B	Blueberry-babyfood	0.110000	1.000	1.000	
13010580	13A	Boysenberry	0.250000	1.000	1.000	
05010610	5A	Broccoli	5.000000	1.000	0.020	
05010611	5A	Broccoli-babyfood	5.000000	1.000	0.020	
05010640	5A	Brussels sprouts	4.000000	1.000	0.020	
05010690	5A	Cabbage	1.500000	1.000	0.010	
05020700	5B	Cabbage, Chinese, bok choy	4.000000	1.000	0.010	
09010750	9A	Cantaloupe	2.160000	1.000	0.010	
09010800	9A	Casaba	2.160000	1.000	0.010	
05010830	5A	Cauliflower	3.000000	1.000	0.020	
10001060	10	Citrus citron	8.000000	1.000	0.040	
05021170	5B	Collards	4.000000	1.000	0.020	
95001300	O	Cranberry	0.500000	1.000	1.000	
95001301	O	Cranberry-babyfood	0.500000	1.000	1.000	
95001310	O	Cranberry, dried	0.500000	1.000	1.000	
95001320	O	Cranberry, juice	0.500000	1.100	1.000	
95001321	O	Cranberry, juice-babyfood	0.500000	1.100	1.000	
09021350	9B	Cucumber	2.500000	1.000	0.010	
13021360	13B	Currant	0.110000	1.000	1.000	
13021370	13B	Currant, dried	0.110000	1.000	1.000	
13011420	13A	Dewberry	0.250000	1.000	1.000	
08001480	8	Eggplant	1.500000	1.000	0.010	
13021490	13B	Elderberry	0.110000	1.000	1.000	
13021740	13B	Gooseberry	0.110000	1.000	1.000	
95001750	O	Grape	3.500000	1.000	0.330	
95001760	O	Grape, juice	3.500000	0.830	0.330	
95001761	O	Grape, juice-babyfood	3.500000	0.830	0.330	
95001770	O	Grape, leaves	3.500000	1.000	0.330	
95001780	O	Grape, raisin	3.500000	0.300	0.330	
95001790	O	Grape, wine and sherry	3.500000	0.830	0.330	
10001800	10	Grapefruit	9.000000	1.000	0.040	
10001810	10	Grapefruit, juice	9.000000	0.026	0.040	
09011870	9A	Honeydew melon	2.160000	1.000	0.010	
13021910	13B	Huckleberry	0.110000	1.000	1.000	
05021940	5B	Kale	4.000000	1.000	0.020	
95001950	O	Kiwifruit	4.500000	1.000	0.140	
05011960	5A	Kohlrabi	5.000000	1.000	0.020	
10001970	10	Kumquat	8.000000	1.000	0.040	
10001990	10	Lemon	13.500000	1.000	0.020	
10002000	10	Lemon, juice	13.500000	0.024	0.020	
10002001	10	Lemon, juice-babyfood	13.500000	0.024	0.020	
10002010	10	Lemon, peel	13.500000	0.280	0.020	
04012040	4A	Lettuce, head	2.500000	1.000	0.010	
04012050	4A	Lettuce, leaf	15.000000	1.000	0.010	
10002060	10	Lime	13.500000	1.000	0.040	
10002070	10	Lime, juice	13.500000	0.024	0.040	
10002071	10	Lime, juice-babyfood	13.500000	0.024	0.040	
13012080	13A	Loganberry	0.250000	1.000	1.000	
12002300	12	Nectarine	4.500000	1.000	0.010	
10002400	10	Orange	8.000000	1.000	0.020	

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10002410	10	Orange, juice	8.000000	0.022	0.020
10002411	10	Orange, juice-babyfood	8.000000	0.022	0.020
10002420	10	Orange, peel	8.000000	0.280	0.020
12002600	12	Peach	4.500000	1.000	0.010
12002601	12	Peach-babyfood	4.500000	1.000	0.010
12002610	12	Peach, dried	4.500000	7.000	0.010
12002611	12	Peach, dried-babyfood	4.500000	7.000	0.010
12002620	12	Peach, juice	4.500000	1.000	0.010
12002621	12	Peach, juice-babyfood	4.500000	1.000	0.010
08002700	8	Pepper, bell	3.500000	1.000	0.010
08002701	8	Pepper, bell-babyfood	3.500000	1.000	0.010
08002710	8	Pepper, bell, dried	3.500000	1.000	0.010
08002711	8	Pepper, bell, dried-babyfood	3.500000	1.000	0.010
08002720	8	Pepper, nonbell	3.500000	1.000	0.010
08002721	8	Pepper, nonbell-babyfood	3.500000	1.000	0.010
08002730	8	Pepper, nonbell, dried	3.500000	1.000	0.010
95002750	0	Peppermint	19.500000	1.000	1.000
95002760	0	Peppermint, oil	19.500000	0.026	1.000
12002850	12	Plum	0.500000	1.000	0.010
12002851	12	Plum-babyfood	0.500000	1.000	0.010
12002860	12	Plum, prune, fresh	0.500000	1.000	0.010
12002861	12	Plum, prune, fresh-babyfood	2.000000	1.000	0.010
12002870	12	Plum, prune, dried	2.000000	5.000	0.010
12002871	12	Plum, prune, dried-babyfood	2.000000	5.000	0.010
12002880	12	Plum, prune, juice	2.000000	1.400	0.010
12002881	12	Plum, prune, juice-babyfood	2.000000	1.400	0.010
01032960	1C	Potato, chips	0.650000	1.000	0.030
01032970	1C	Potato, dry (granules/ flakes)	0.650000	6.500	0.030
01032971	1C	Potato, dry (granules/ flakes)-b	0.650000	6.500	0.030
01032980	1C	Potato, flour	0.650000	6.500	0.030
01032981	1C	Potato, flour-babyfood	0.650000	6.500	0.030
01032990	1C	Potato, tuber, w/peel	0.650000	1.000	0.030
01032991	1C	Potato, tuber, w/peel-babyfood	0.650000	1.000	0.030
01033000	1C	Potato, tuber, w/o peel	0.650000	1.000	0.030
01033001	1C	Potato, tuber, w/o peel-babyfood	0.650000	1.000	0.030
10003070	10	Pummelo	9.000000	1.000	0.040
09023080	9B	Pumpkin	2.500000	1.000	0.010
09023090	9B	Pumpkin, seed	2.500000	1.000	0.010
13013200	13A	Raspberry	0.250000	1.000	1.000
13013201	13A	Raspberry-babyfood	0.250000	1.000	1.000
13013210	13A	Raspberry, juice	0.250000	1.000	1.000
13013211	13A	Raspberry, juice-babyfood	0.250000	1.000	1.000
95003520	0	Spearmint	19.500000	1.000	1.000
95003530	0	Spearmint, oil	19.500000	0.026	1.000
09023560	9B	Squash, summer	2.500000	1.000	0.010
09023561	9B	Squash, summer-babyfood	2.500000	1.000	0.010
09023570	9B	Squash, winter	2.500000	1.000	0.010
09023571	9B	Squash, winter-babyfood	2.500000	1.000	0.010
95003590	0	Strawberry	1.000000	1.000	0.020
95003591	0	Strawberry-babyfood	1.000000	1.000	0.020
95003600	0	Strawberry, juice	1.000000	1.000	0.020
95003601	0	Strawberry, juice-babyfood	1.000000	1.000	0.020
10003690	10	Tangerine	8.000000	1.000	0.040
10003700	10	Tangerine, juice	8.000000	0.028	0.040
08003750	8	Tomato	1.500000	1.000	0.010
08003751	8	Tomato-babyfood	1.500000	1.000	0.010
08003760	8	Tomato, paste	1.500000	1.500	0.010
08003761	8	Tomato, paste-babyfood	1.500000	1.500	0.010
08003770	8	Tomato, puree	1.500000	1.000	0.010
08003771	8	Tomato, puree-babyfood	1.500000	1.000	0.010
08003780	8	Tomato, dried	1.500000	14.300	0.010
08003781	8	Tomato, dried-babyfood	1.500000	14.300	0.010
08003790	8	Tomato, juice	1.500000	1.500	0.010
09013990	9A	Watermelon	2.160000	1.000	0.010
09014000	9A	Watermelon, juice	2.160000	1.000	0.010

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### Attachment 4. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from Background Residues in Food.

Filename: C:\My Documents\Chemistry Reviews\DEEM Runs\Sulfuryl Fluoride\Worst-Case Background Food.R98

Chemical: Fluoride

RfD(Chronic): .114 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day

RfD(Acute): 0 mg/kg bw/day NOEL(Acute): 0 mg/kg bw/day

Date created/last modified: 12-10-2003/08:13:51/8

Program ver. 1.30

Comment: Residues from Taves, D. R. 1983. Br. J. Nutr. 49:295-301 unless otherwise noted.

EPA Code	Crop Grp	Commodity Name	Def Res (ppm)	Adj.Factors #1 #2		Comment
95000010	O	Acerola	0.494000	1.000	1.000	Based on Beans in F water
18000020	18	Alfalfa, seed	0.494000	1.000	1.000	Based on Beans in F water
14000030	14	Almond	1.200000	1.000	1.000	Field Trial 1/2 LOQ
14000031	14	Almond-babyfood	1.200000	1.000	1.000	Field Trial 1/2 LOQ
14000040	14	Almond, oil	1.200000	1.000	1.000	Field Trial 1/2 LOQ
14000041	14	Almond, oil-babyfood	1.200000	1.000	1.000	Field Trial 1/2 LOQ
04010050	4A	Amaranth, leafy	0.133000	1.000	1.000	From Lettuce
95000060	O	Amaranth, grain	0.494000	1.000	1.000	Based on Beans in F water
11000070	11	Apple, fruit with peel	0.019000	1.000	1.000	From Grapefruit Juice
11000080	11	Apple, peeled fruit	0.019000	1.000	1.000	From Grapefruit Juice
11000081	11	Apple, peeled fruit-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
11000090	11	Apple, dried	0.019000	1.000	1.000	From Grapefruit Juice
11000091	11	Apple, dried-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
11000100	11	Apple, juice	0.019000	1.000	1.000	From Grapefruit Juice
11000101	11	Apple, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
11000110	11	Apple, sauce	0.019000	1.000	1.000	From Grapefruit Juice
11000111	11	Apple, sauce-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12000120	12	Apricot	0.019000	1.000	1.000	From Grapefruit Juice
12000121	12	Apricot-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12000130	12	Apricot, dried	0.019000	1.000	1.000	From Grapefruit Juice
12000140	12	Apricot, juice	0.019000	1.000	1.000	From Grapefruit Juice
12000141	12	Apricot, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
01030150	1CD	Arrowroot, flour	0.380000	1.000	1.000	From Potato
01030151	1CD	Arrowroot, flour-babyfood	0.380000	1.000	1.000	From Potato
95000160	O	Artichoke, globe	0.494000	1.000	1.000	Based on Beans in F water
01030170	1CD	Artichoke, Jerusalem	0.380000	1.000	1.000	From Potato
04010180	4A	Arugula	0.133000	1.000	1.000	From Lettuce
95000190	O	Asparagus	0.494000	1.000	1.000	Based on Beans in F water
95000200	O	Avocado	0.494000	1.000	1.000	Based on Beans in F water
09020210	9B	Balsam pear	0.019000	1.000	1.000	From Squash
95000220	O	Bamboo, shoots	0.494000	1.000	1.000	Based on Beans in F water
95000230	O	Banana	0.494000	1.000	1.000	Based on Beans in F water
95000231	O	Banana-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95000240	O	Banana, dried	0.494000	1.000	1.000	Based on Beans in F water
95000241	O	Banana, dried-babyfood	0.494000	1.000	1.000	Based on Beans in F water
15000250	15	Barley, pearled barley	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15000251	15	Barley, pearled barley-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15000260	15	Barley, flour	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15000261	15	Barley, flour-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15000270	15	Barley, bran	0.152000	1.000	1.000	Based on Puffed Wheat (R)
19010280	19A	Basil, fresh leaves	0.494000	1.000	1.000	Based on Beans in F water
19010281	19A	Basil, fresh leaves-babyfood	0.494000	1.000	1.000	Based on Beans in F water
19010290	19A	Basil, dried leaves	0.494000	1.000	1.000	Based on Beans in F water
19010291	19A	Basil, dried leaves-babyfood	0.494000	1.000	1.000	Based on Beans in F water
06030300	6C	Bean, black, seed	0.494000	1.000	1.000	From Beans (Cooked in F Water)
06020310	6B	Bean, broad, succulent	0.494000	1.000	1.000	From Beans (Cooked in F Water)
06030320	6C	Bean, broad, seed	0.494000	1.000	1.000	From Beans (Cooked in F Water)
06020330	6B	Bean, cowpea, succulent	0.494000	1.000	1.000	From Beans (Cooked in F Water)
06030340	6C	Bean, cowpea, seed	0.494000	1.000	1.000	From Beans (Cooked in F Water)
06030350	6C	Bean, great northern, seed	0.494000	1.000	1.000	From Beans (Cooked in F Water)
06030360	6C	Bean, kidney, seed	0.494000	1.000	1.000	From Beans (Cooked in F Water)

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Water)						
06020370 6B	Bean, lima, succulent	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
06030380 6C	Bean, lima, seed	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
06030390 6C	Bean, mung, seed	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
06030400 6C	Bean, navy, seed	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
06030410 6C	Bean, pink, seed	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
06030420 6C	Bean, pinto, seed	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
06010430 6A	Bean, snap, succulent	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
06010431 6A	Bean, snap, succulent-babyfood	0.494000	1.000	1.000	From Beans (Cooked in F	
Water)						
21000440 M	Beef, meat	0.150000	1.000	1.000		
21000441 M	Beef, meat-babyfood	0.150000	1.000	1.000		
21000450 M	Beef, meat, dried	0.150000	1.000	1.000		
21000460 M	Beef, meat byproducts	0.150000	1.000	1.000		
21000461 M	Beef, meat byproducts-babyfood	0.150000	1.000	1.000		
21000470 M	Beef, fat	0.150000	1.000	1.000		
21000471 M	Beef, fat-babyfood	0.150000	1.000	1.000		
21000480 M	Beef, kidney	0.150000	1.000	1.000		
21000490 M	Beef, liver	0.150000	1.000	1.000		
21000491 M	Beef, liver-babyfood	0.150000	1.000	1.000		
01010500 1AB	Beet, garden, roots	0.380000	1.000	1.000	From Potato	
01010501 1AB	Beet, garden, roots-babyfood	0.380000	1.000	1.000	From Potato	
02000510 2	Beet, garden, tops	0.266000	1.000	1.000	From Greens	
01010520 1A	Beet, sugar	0.380000	1.000	1.000	From Potato	
01010521 1A	Beet, sugar-babyfood	0.380000	1.000	1.000	From Potato	
01010530 1A	Beet, sugar, molasses	0.380000	1.000	1.000	From Potato	
01010531 1A	Beet, sugar, molasses-babyfood	0.380000	1.000	1.000	From Potato	
95000540 O	Belgium endive	0.494000	1.000	1.000	Based on Beans in F water	
13010550 13A	Blackberry	0.076000	1.000	1.000	From Worst-case Fruits	
13010560 13A	Blackberry, juice	0.076000	1.000	1.000	From Worst-case Fruits	
13010561 13A	Blackberry, juice-babyfood	0.076000	1.000	1.000	From Worst-case Fruits	
13020570 13B	Blueberry	0.076000	1.000	1.000	From Worst-case Fruits	
13020571 13B	Blueberry-babyfood	0.076000	1.000	1.000	From Worst-case Fruits	
13010580 13A	Boysenberry	0.076000	1.000	1.000	From Worst-case Fruits	
14000590 14	Brazil nut	1.200000	1.000	1.000	Field Trial 1/2 LOQ	
95000600 O	Breadfruit	0.494000	1.000	1.000	Based on Beans in F water	
05010610 5A	Broccoli	0.076000	1.000	1.000		
05010611 5A	Broccoli-babyfood	0.076000	1.000	1.000		
05010620 5A	Broccoli, Chinese	0.076000	1.000	1.000	From Broccoli	
05020630 5B	Broccoli raab	0.076000	1.000	1.000	From Broccoli	
05010640 5A	Brussels sprouts	0.076000	1.000	1.000	From Broccoli	
15000650 15	Buckwheat	0.152000	1.000	1.000	Based on Puffed Wheat (R)	
15000660 15	Buckwheat, flour	0.152000	1.000	1.000	Based on Puffed Wheat (R)	
01010670 1AB	Burdock	0.380000	1.000	1.000	From Potato	
14000680 14	Butternut	1.200000	1.000	1.000	Field Trial 1/2 LOQ	
05010690 5A	Cabbage	0.076000	1.000	1.000	From Broccoli	
05020700 5B	Cabbage, Chinese, bok choy	0.076000	1.000	1.000	From Broccoli	
05010710 5A	Cabbage, Chinese, napa	0.076000	1.000	1.000	From Broccoli	
05010720 5A	Cabbage, Chinese, mustard	0.076000	1.000	1.000	From Broccoli	
95000730 O	Cactus	0.494000	1.000	1.000	Based on Beans in F water	
95000740 O	Canistel	0.494000	1.000	1.000	Based on Beans in F water	
09010750 9A	Cantaloupe	0.019000	1.000	1.000	From Squash	
04020760 4B	Cardoon	0.133000	1.000	1.000	From Lettuce	
95000770 O	Carob	0.494000	1.000	1.000	Based on Beans in F water	
01010780 1AB	Carrot	0.380000	1.000	1.000	From Potato	
01010781 1AB	Carrot-babyfood	0.380000	1.000	1.000	From Potato	
01010790 1AB	Carrot, juice	0.380000	1.000	1.000	From Potato	
09010800 9A	Casaba	0.019000	1.000	1.000	From Squash	
14000810 14	Cashew	1.200000	1.000	1.000	Field Trial 1/2 LOQ	
01030820 1CD	Cassava	0.380000	1.000	1.000	From Potato	
01030821 1CD	Cassava-babyfood	0.380000	1.000	1.000	From Potato	
05010830 5A	Cauliflower	0.076000	1.000	1.000	From Broccoli	
01010840 1AB	Celeriac	0.380000	1.000	1.000	From Potato	
04020850 4B	Celery	0.133000	1.000	1.000	From Lettuce	
04020851 4B	Celery-babyfood	0.133000	1.000	1.000	From Lettuce	
04020860 4B	Celery, juice	0.133000	1.000	1.000	From Lettuce	

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04020870	4B	Celtuce	0.133000	1.000	1.000	From Lettuce
09020880	9B	Chayote, fruit	0.019000	1.000	1.000	From Squash
95000890	O	Cherimoya	0.494000	1.000	1.000	Based on Beans in F water
12000900	12	Cherry	0.019000	1.000	1.000	From Grapefruit Juice
12000901	12	Cherry-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12000910	12	Cherry, juice	0.019000	1.000	1.000	From Grapefruit Juice
12000911	12	Cherry, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
14000920	14	Chestnut	1.200000	1.000	1.000	Field Trial 1/2 LOQ
40000930	P	Chicken, meat	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
40000931	P	Chicken, meat-babyfood	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
40000940	P	Chicken, liver	1.000000	1.000	1.000	
40000950	P	Chicken, meat byproducts	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
40000951	P	Chicken, meat byproducts-babyfoo	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
40000960	P	Chicken, fat	1.000000	1.000	1.000	
40000961	P	Chicken, fat-babyfood	1.000000	1.000	1.000	
40000970	P	Chicken, skin	1.000000	1.000	1.000	
40000971	P	Chicken, skin-babyfood	1.000000	1.000	1.000	
06030980	6C	Chickpea, seed	0.494000	1.000	1.000	From Beans (Cooked in F
Water)						
06030981	6C	Chickpea, seed-babyfood	0.494000	1.000	1.000	From Beans (Cooked in F
Water)						
06030990	6C	Chickpea, flour	0.494000	1.000	1.000	From Beans (Cooked in F
Water)						
01011000	1AB	Chicory, roots	0.380000	1.000	1.000	From Potato
02001010	2	Chicory, tops	0.266000	1.000	1.000	From Greens
09021020	9B	Chinese waxgourd	0.019000	1.000	1.000	From Squash
19011030	19A	Chive	0.494000	1.000	1.000	Based on Beans in F water
04011040	4A	Chrysanthemum, garland	0.133000	1.000	1.000	From Lettuce
19021050	19B	Cinnamon	0.494000	1.000	1.000	Based on Beans in F water
19021051	19B	Cinnamon-babyfood	0.494000	1.000	1.000	Based on Beans in F water
10001060	10	Citrus citron	0.019000	1.000	1.000	From Grapefruit Juice
10001070	10	Citrus hybrids	0.019000	1.000	1.000	From Grapefruit Juice
10001080	10	Citrus, oil	0.019000	1.000	1.000	From Grapefruit Juice
95001090	O	Cocoa bean, chocolate	0.494000	1.000	1.000	Based on Beans in F water
95001100	O	Cocoa bean, powder	0.494000	1.000	1.000	Based on Beans in F water
95001110	O	Coconut, meat	0.494000	1.000	1.000	Based on Beans in F water
95001111	O	Coconut- meat-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95001120	O	Coconut, dried	0.494000	1.000	1.000	Based on Beans in F water
95001130	O	Coconut, milk	0.494000	1.000	1.000	Based on Beans in F water
95001140	O	Coconut, oil	0.494000	1.000	1.000	Based on Beans in F water
95001141	O	Coconut, oil-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95001150	O	Coffee, roasted bean	0.494000	1.000	1.000	Based on Beans in F water
95001160	O	Coffee, instant	0.494000	1.000	1.000	Based on Beans in F water
05021170	5B	Collards	0.076000	1.000	1.000	From Broccoli
19011180	19A	Coriander, leaves	0.494000	1.000	1.000	Based on Beans in F water
19011181	19A	Coriander, leaves-babyfood	0.494000	1.000	1.000	Based on Beans in F water
19021190	19B	Coriander, seed	0.494000	1.000	1.000	Based on Beans in F water
19021191	19B	Coriander, seed-babyfood	0.494000	1.000	1.000	Based on Beans in F water
15001200	15	Corn, field, flour	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001201	15	Corn, field, flour-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001210	15	Corn, field, meal	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001211	15	Corn, field, meal-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001220	15	Corn, field, bran	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001230	15	Corn, field, starch	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001231	15	Corn, field, starch-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001240	15	Corn, field, syrup	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001241	15	Corn, field, syrup-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001250	15	Corn, field, oil	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001251	15	Corn, field, oil-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001260	15	Corn, pop	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001270	15	Corn, sweet	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15001271	15	Corn, sweet-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
95001280	O	Cottonseed, oil	0.494000	1.000	1.000	Based on Beans in F water
95001281	O	Cottonseed, oil-babyfood	0.494000	1.000	1.000	Based on Beans in F water
11001290	11	Crabapple	0.019000	1.000	1.000	From Grapefruit Juice
95001300	O	Cranberry	0.494000	1.000	1.000	Based on Beans in F water
95001301	O	Cranberry-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95001310	O	Cranberry, dried	0.494000	1.000	1.000	Based on Beans in F water
95001320	O	Cranberry, juice	0.494000	1.000	1.000	Based on Beans in F water

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95001321	O	Cranberry, juice-babyfood	0.494000	1.000	1.000	Based on Beans in F water
04011330	4A	Cress, garden	0.133000	1.000	1.000	From Lettuce
04011340	4A	Cress, upland	0.133000	1.000	1.000	From Lettuce
09021350	9B	Cucumber	0.019000	1.000	1.000	From Squash
13021360	13B	Currant	0.076000	1.000	1.000	From Worst-case Fruits
13021370	13B	Currant, dried	0.076000	1.000	1.000	From Worst-case Fruits
04011380	4A	Dandelion, leaves	0.133000	1.000	1.000	From Lettuce
01031390	1CD	Dasheen, corn	0.380000	1.000	1.000	From Potato
02001400	2	Dasheen, leaves	0.266000	1.000	1.000	From Greens
95001410	O	Date	0.494000	1.000	1.000	Based on Beans in F water
13011420	13A	Dewberry	0.076000	1.000	1.000	From Worst-case Fruits
19021430	19B	Dill, seed	0.494000	1.000	1.000	Based on Beans in F water
19011440	19A	Dillweed	0.494000	1.000	1.000	Based on Beans in F water
70001450	P	Egg, whole	0.057000	1.000	1.000	
70001451	P	Egg, whole-babyfood	0.057000	1.000	1.000	
70001460	P	Egg, white	0.057000	1.000	1.000	
70001461	P	Egg, white (solids)-babyfood	0.057000	1.000	1.000	
70001470	P	Egg, yolk	0.057000	1.000	1.000	
70001471	P	Egg, yolk-babyfood	0.057000	1.000	1.000	
08001480	8	Eggplant	0.038000	1.000	1.000	From Tomato
13021490	13B	Elderberry	0.076000	1.000	1.000	From Worst-case Fruits
04011500	4A	Endive	0.133000	1.000	1.000	From Lettuce
95001510	O	Feijoa	0.494000	1.000	1.000	Based on Beans in F water
04021520	4B	Fennel, Florence	0.133000	1.000	1.000	From Lettuce
95001530	O	Fig	0.494000	1.000	1.000	Based on Beans in F water
95001540	O	Fig, dried	0.494000	1.000	1.000	Based on Beans in F water
14001550	14	Filbert	1.200000	1.000	1.000	Field Trial 1/2 LOQ
14001560	14	Filbert, oil	1.200000	1.000	1.000	Field Trial 1/2 LOQ
80001570	F	Fish-freshwater finfish	0.209000	1.000	1.000	
80001580	F	Fish-freshwater finfish, farm ra	0.209000	1.000	1.000	
80001590	F	Fish-saltwater finfish, tuna	0.209000	1.000	1.000	
80001600	F	Fish-saltwater finfish, other	0.209000	1.000	1.000	
80001610	F	Fish-shellfish, crustacean	0.209000	1.000	1.000	
80001620	F	Fish-shellfish, mollusc	0.209000	1.000	1.000	
20001630	20	Flaxseed, oil	0.494000	1.000	1.000	Based on Beans in F water
03001640	3	Garlic	0.266000	1.000	1.000	From Beets
03001650	3	Garlic, dried	0.266000	1.000	1.000	From Beets
03001651	3	Garlic, dried-babyfood	0.266000	1.000	1.000	From Beets
01031660	1CD	Ginger	0.380000	1.000	1.000	From Potato
01031661	1CD	Ginger-babyfood	0.380000	1.000	1.000	From Potato
01031670	1CD	Ginger, dried	0.380000	1.000	1.000	From Potato
01011680	1AB	Ginseng, dried	0.380000	1.000	1.000	From Potato
23001690	M	Goat, meat	0.150000	1.000	1.000	
23001700	M	Goat, meat byproducts	0.150000	1.000	1.000	
23001710	M	Goat, fat	0.150000	1.000	1.000	
23001720	M	Goat, kidney	0.150000	1.000	1.000	
23001730	M	Goat, liver	0.150000	1.000	1.000	
13021740	13B	Gooseberry	0.076000	1.000	1.000	From Worst-case Fruits
95001750	O	Grape	0.494000	1.000	1.000	Based on Beans in F water
95001760	O	Grape, juice	0.494000	1.000	1.000	Based on Beans in F water
95001761	O	Grape, juice-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95001770	O	Grape, leaves	0.494000	1.000	1.000	Based on Beans in F water
95001780	O	Grape, raisin	0.494000	1.000	1.000	Based on Beans in F water
95001790	O	Grape, wine and sherry	0.494000	1.000	1.000	Based on Beans in F water
10001800	10	Grapefruit	0.019000	1.000	1.000	From Grapefruit Juice
10001810	10	Grapefruit, juice	0.019000	1.000	1.000	From Grapefruit Juice
06031820	6C	Guar, seed	0.494000	1.000	1.000	From Beans (Cooked in F
Water)						
06031821	6C	Guar, seed-babyfood	0.494000	1.000	1.000	From Beans (Cooked in F
Water)						
95001830	O	Guava	0.494000	1.000	1.000	Based on Beans in F water
95001831	O	Guava-babyfood	0.494000	1.000	1.000	Based on Beans in F water
19011840	19A	Herbs, other	0.494000	1.000	1.000	Based on Beans in F water
19011841	19A	Herbs, other-babyfood	0.494000	1.000	1.000	Based on Beans in F water
14001850	14	Hickory nut	1.200000	1.000	1.000	Field Trial 1/2 LOQ
95001860	O	Honey	0.494000	1.000	1.000	Based on Beans in F water
95001861	O	Honey-babyfood	0.494000	1.000	1.000	Based on Beans in F water
09011870	9A	Honeydew melon	0.019000	1.000	1.000	From Squash
95001880	O	Hop	0.494000	1.000	1.000	Based on Beans in F water
24001890	M	Horse, meat	0.150000	1.000	1.000	
01011900	1AB	Horseradish	0.380000	1.000	1.000	From Potato
13021910	13B	Huckleberry	0.076000	1.000	1.000	From Worst-case Fruits
95001920	O	Jaboticaba	0.494000	1.000	1.000	Based on Beans in F water



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95001930	O	Jackfruit	0.494000	1.000	1.000	Based on Beans in F water
05021940	5B	Kale	0.076000	1.000	1.000	From Broccoli
95001950	O	Kiwifruit	0.494000	1.000	1.000	Based on Beans in F water
05011960	5A	Kohlrabi	0.076000	1.000	1.000	From Broccoli
10001970	10	Kumquat	0.019000	1.000	1.000	From Grapefruit Juice
03001980	3	Leek	0.266000	1.000	1.000	From Beets
10001990	10	Lemon	0.019000	1.000	1.000	From Grapefruit Juice
10002000	10	Lemon, juice	0.019000	1.000	1.000	From Grapefruit Juice
10002001	10	Lemon, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
10002010	10	Lemon, peel	0.019000	1.000	1.000	From Grapefruit Juice
19012020	19A	Lemongrass	0.494000	1.000	1.000	Based on Beans in F water
06032030	6C	Lentil, seed	0.494000	1.000	1.000	From Beans (Cooked in F
Water)						
04012040	4A	Lettuce, head	0.133000	1.000	1.000	From Lettuce
04012050	4A	Lettuce, leaf	0.133000	1.000	1.000	From Lettuce
10002060	10	Lime	0.019000	1.000	1.000	From Grapefruit Juice
10002070	10	Lime, juice	0.019000	1.000	1.000	From Grapefruit Juice
10002071	10	Lime, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
13012080	13A	Loganberry	0.076000	1.000	1.000	From Worst-case Fruits
95002090	O	Longan	0.494000	1.000	1.000	Based on Beans in F water
11002100	11	Loquat	0.019000	1.000	1.000	From Grapefruit Juice
95002110	O	Lychee	0.494000	1.000	1.000	Based on Beans in F water
95002120	O	Lychee, dried	0.494000	1.000	1.000	Based on Beans in F water
14002130	14	Macadamia nut	1.200000	1.000	1.000	Field Trial 1/2 LOQ
95002140	O	Mamey apple	0.494000	1.000	1.000	Based on Beans in F water
95002150	O	Mango	0.494000	1.000	1.000	Based on Beans in F water
95002151	O	Mango-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002160	O	Mango, dried	0.494000	1.000	1.000	Based on Beans in F water
95002170	O	Mango, juice	0.494000	1.000	1.000	Based on Beans in F water
95002171	O	Mango, juice-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002180	O	Maple, sugar	0.494000	1.000	1.000	Based on Beans in F water
95002190	O	Maple syrup	0.494000	1.000	1.000	Based on Beans in F water
19012200	19A	Marjoram	0.494000	1.000	1.000	Based on Beans in F water
19012201	19A	Marjoram-babyfood	0.494000	1.000	1.000	Based on Beans in F water
28002210	M	Meat, game	0.150000	1.000	1.000	
27002220	D	Milk, fat	0.019000	1.000	1.000	
27002221	D	Milk, fat - baby food/infant for	0.019000	1.000	1.000	
27012230	D	Milk, nonfat solids	0.019000	1.000	1.000	
27012231	D	Milk, nonfat solids-baby food/in	0.019000	1.000	1.000	
27022240	D	Milk, water	0.019000	1.000	1.000	
27022241	D	Milk, water-babyfood/infant form	0.019000	1.000	1.000	
27032251	D	Milk, sugar (lactose)-baby food/	0.019000	1.000	1.000	
15002260	15	Millet, grain	0.152000	1.000	1.000	Based on Puffed Wheat (R)
95002270	O	Mulberry	0.494000	1.000	1.000	Based on Beans in F water
95002280	O	Mushroom	0.494000	1.000	1.000	Based on Beans in F water
05022290	5B	Mustard greens	0.076000	1.000	1.000	From Broccoli
12002300	12	Nectarine	0.019000	1.000	1.000	From Grapefruit Juice
15002310	15	Oat, bran	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15002320	15	Oat, flour	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15002321	15	Oat, flour-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15002330	15	Oat, groats/rolled oats	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15002331	15	Oat, groats/rolled oats-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
08002340	8	Okra	0.038000	1.000	1.000	From Tomato
95002350	O	Olive	0.494000	1.000	1.000	Based on Beans in F water
95002360	O	Olive, oil	0.494000	1.000	1.000	Based on Beans in F water
03002370	3	Onion, dry bulb	0.266000	1.000	1.000	From Beets
03002371	3	Onion, dry bulb-babyfood	0.266000	1.000	1.000	From Beets
03002380	3	Onion, dry bulb, dried	0.266000	1.000	1.000	From Beets
03002381	3	Onion, dry bulb, dried-babyfood	0.266000	1.000	1.000	From Beets
03002390	3	Onion, green	0.266000	1.000	1.000	From Beets
10002400	10	Orange	0.019000	1.000	1.000	From Grapefruit Juice
10002410	10	Orange, juice	0.019000	1.000	1.000	From Grapefruit Juice
10002411	10	Orange, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
10002420	10	Orange, peel	0.019000	1.000	1.000	From Grapefruit Juice
95002430	O	Palm heart, leaves	0.494000	1.000	1.000	Based on Beans in F water
95002440	O	Palm, oil	0.494000	1.000	1.000	Based on Beans in F water
95002441	O	Palm, oil-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002450	O	Papaya	0.494000	1.000	1.000	Based on Beans in F water
95002451	O	Papaya-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002460	O	Papaya, dried	0.494000	1.000	1.000	Based on Beans in F water
95002470	O	Papaya, juice	0.494000	1.000	1.000	Based on Beans in F water
04012480	4A	Parsley, leaves	0.133000	1.000	1.000	From Lettuce
19012490	19A	Parsley, dried leaves	0.494000	1.000	1.000	Based on Beans in F water

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19012491	19A	Parsley, dried leaves-babyfood	0.494000	1.000	1.000	Based on Beans in F water
01012500	1AB	Parsley, turnip rooted	0.380000	1.000	1.000	From Potato
01012510	1AB	Parsnip	0.380000	1.000	1.000	From Potato
01012511	1AB	Parsnip-babyfood	0.380000	1.000	1.000	From Potato
95002520	O	Passionfruit	0.494000	1.000	1.000	Based on Beans in F water
95002521	O	Passionfruit-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002530	O	Passionfruit, juice	0.494000	1.000	1.000	Based on Beans in F water
95002531	O	Passionfruit, juice-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002540	O	Pawpaw	0.494000	1.000	1.000	Based on Beans in F water
06022550	6B	Pea, succulent	0.494000	1.000	1.000	From Beans (Cooked in F
06022551	6B	Pea, succulent-babyfood	0.494000	1.000	1.000	From Beans (Cooked in F
06032560	6C	Pea, dry	0.494000	1.000	1.000	From Beans (Cooked in F
06032561	6C	Pea, dry-babyfood	0.494000	1.000	1.000	From Beans (Cooked in F
06012570	6A	Pea, edible podded, succulent	0.494000	1.000	1.000	From Beans (Cooked in F
06032580	6C	Pea, pigeon, seed	0.494000	1.000	1.000	From Beans (Cooked in F
06022590	6B	Pea, pigeon, succulent	0.494000	1.000	1.000	From Beans (Cooked in F
12002600	12	Peach	0.019000	1.000	1.000	From Grapefruit Juice
12002601	12	Peach-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12002610	12	Peach, dried	0.019000	1.000	1.000	From Grapefruit Juice
12002611	12	Peach, dried-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12002620	12	Peach, juice	0.019000	1.000	1.000	From Grapefruit Juice
12002621	12	Peach, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
95002630	O	Peanut	0.494000	1.000	1.000	Based on Beans in F water
95002640	O	Peanut, butter	0.494000	1.000	1.000	Based on Beans in F water
95002650	O	Peanut, oil	0.494000	1.000	1.000	Based on Beans in F water
11002660	11	Pear	0.019000	1.000	1.000	From Grapefruit Juice
11002661	11	Pear-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
11002670	11	Pear, dried	0.019000	1.000	1.000	From Grapefruit Juice
11002680	11	Pear, juice	0.019000	1.000	1.000	From Grapefruit Juice
11002681	11	Pear, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
14002690	14	Pecan	1.200000	1.000	1.000	Field Trial 1/2 LOQ
08002700	8	Pepper, bell	0.038000	1.000	1.000	From Tomato
08002701	8	Pepper, bell-babyfood	0.038000	1.000	1.000	From Tomato
08002710	8	Pepper, bell, dried	0.038000	1.000	1.000	From Tomato
08002711	8	Pepper, bell, dried-babyfood	0.038000	1.000	1.000	From Tomato
08002720	8	Pepper, nonbell	0.038000	1.000	1.000	From Tomato
08002721	8	Pepper, nonbell-babyfood	0.038000	1.000	1.000	From Tomato
08002730	8	Pepper, nonbell, dried	0.038000	1.000	1.000	From Tomato
19022740	19B	Pepper, black and white	0.494000	1.000	1.000	Based on Beans in F water
19022741	19B	Pepper, black and white-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002750	O	Peppermint	0.494000	1.000	1.000	Based on Beans in F water
95002760	O	Peppermint, oil	0.494000	1.000	1.000	Based on Beans in F water
95002770	O	Persimmon	0.494000	1.000	1.000	Based on Beans in F water
95002780	O	Pine nut	0.494000	1.000	1.000	Based on Beans in F water
95002790	O	Pineapple	0.494000	1.000	1.000	Based on Beans in F water
95002791	O	Pineapple-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95002800	O	Pineapple, dried	0.494000	1.000	1.000	Based on Beans in F water
95002810	O	Pineapple, juice	0.494000	1.000	1.000	Based on Beans in F water
95002811	O	Pineapple, juice-babyfood	0.494000	1.000	1.000	Based on Beans in F water
14002820	14	Pistachio	1.200000	1.000	1.000	Field Trial 1/2 LOQ
95002830	O	Plantain	0.494000	1.000	1.000	Based on Beans in F water
95002840	O	Plantain, dried	0.494000	1.000	1.000	Based on Beans in F water
12002850	12	Plum	0.019000	1.000	1.000	From Grapefruit Juice
12002851	12	Plum-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12002860	12	Plum, prune, fresh	0.019000	1.000	1.000	From Grapefruit Juice
12002861	12	Plum, prune, fresh-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12002870	12	Plum, prune, dried	0.019000	1.000	1.000	From Grapefruit Juice
12002871	12	Plum, prune, dried-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
12002880	12	Plum, prune, juice	0.019000	1.000	1.000	From Grapefruit Juice
12002881	12	Plum, prune, juice-babyfood	0.019000	1.000	1.000	From Grapefruit Juice
95002890	O	Pomegranate	0.494000	1.000	1.000	Based on Beans in F water
25002900	M	Pork, meat	0.418000	1.000	1.000	
25002901	M	Pork, meat-babyfood	0.418000	1.000	1.000	
25002910	M	Pork, skin	0.418000	1.000	1.000	
25002920	M	Pork, meat byproducts	0.418000	1.000	1.000	
25002921	M	Pork, meat byproducts-babyfood	0.418000	1.000	1.000	

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25002930	M	Pork, fat	0.418000	1.000	1.000	
25002931	M	Pork, fat-babyfood	0.418000	1.000	1.000	
25002940	M	Pork, kidney	0.418000	1.000	1.000	
25002950	M	Pork, liver	0.418000	1.000	1.000	
01032960	1C	Potato, chips	0.380000	1.000	1.000	
01032970	1C	Potato, dry (granules/ flakes)	0.380000	1.000	1.000	
01032971	1C	Potato, dry (granules/ flakes)-b	0.380000	1.000	1.000	
01032980	1C	Potato, flour	0.380000	1.000	1.000	
01032981	1C	Potato, flour-babyfood	0.380000	1.000	1.000	
01032990	1C	Potato, tuber, w/peel	0.380000	1.000	1.000	
01032991	1C	Potato, tuber, w/peel-babyfood	0.380000	1.000	1.000	
01033000	1C	Potato, tuber, w/o peel	0.380000	1.000	1.000	
01033001	1C	Potato, tuber, w/o peel-babyfood	0.380000	1.000	1.000	
60003010	P	Poultry, other, meat	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
60003020	P	Poultry, other, liver	1.000000	1.000	1.000	
60003030	P	Poultry, other, meat byproducts	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
60003040	P	Poultry, other, fat	1.000000	1.000	1.000	
60003050	P	Poultry, other, skin	1.000000	1.000	1.000	
95003060	O	Psyllium, seed	0.494000	1.000	1.000	Based on Beans in F water
10003070	10	Pummelo	0.019000	1.000	1.000	From Grapefruit Juice
09023080	9B	Pumpkin	0.019000	1.000	1.000	From Squash
09023090	9B	Pumpkin, seed	0.019000	1.000	1.000	From Squash
11003100	11	Quince	0.019000	1.000	1.000	From Grapefruit Juice
95003110	O	Quinoa, grain	0.494000	1.000	1.000	Based on Beans in F water
29003120	M	Rabbit, meat	0.150000	1.000	1.000	
04013130	4A	Radicchio	0.133000	1.000	1.000	From Lettuce
01013140	1AB	Radish, roots	0.380000	1.000	1.000	From Potato
02003150	2	Radish, tops	0.266000	1.000	1.000	From Greens
01013160	1AB	Radish, Oriental, roots	0.380000	1.000	1.000	From Potato
02003170	2	Radish, Oriental, tops	0.266000	1.000	1.000	From Greens
05023180	5B	Rape greens	0.076000	1.000	1.000	From Broccoli
20003190	20	Rapeseed, oil	0.494000	1.000	1.000	Based on Beans in F water
20003191	20	Rapeseed, oil-babyfood	0.494000	1.000	1.000	Based on Beans in F water
13013200	13A	Raspberry	0.076000	1.000	1.000	From Worst-case Fruits
13013201	13A	Raspberry-babyfood	0.076000	1.000	1.000	From Worst-case Fruits
13013210	13A	Raspberry, juice	0.076000	1.000	1.000	From Worst-case Fruits
13013211	13A	Raspberry, juice-babyfood	0.076000	1.000	1.000	From Worst-case Fruits
04023220	4B	Rhubarb	0.133000	1.000	1.000	From Lettuce
15003230	15	Rice, white	0.171000	1.000	1.000	Based on Puffed Rice (R)
15003231	15	Rice, white-babyfood	0.171000	1.000	1.000	Based on Puffed Rice (R)
15003240	15	Rice, brown	0.171000	1.000	1.000	Based on Puffed Rice (R)
15003241	15	Rice, brown-babyfood	0.171000	1.000	1.000	Based on Puffed Rice (R)
15003250	15	Rice, flour	0.171000	1.000	1.000	Based on Puffed Rice (R)
15003251	15	Rice, flour-babyfood	0.171000	1.000	1.000	Based on Puffed Rice (R)
15003260	15	Rice, bran	0.171000	1.000	1.000	Based on Puffed Rice (R)
15003261	15	Rice, bran-babyfood	0.171000	1.000	1.000	Based on Puffed Rice (R)
01013270	1AB	Rutabaga	0.380000	1.000	1.000	From Potato
15003280	15	Rye, grain	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15003290	15	Rye, flour	0.152000	1.000	1.000	Based on Puffed Wheat (R)
20003300	20	Safflower, oil	0.494000	1.000	1.000	Based on Beans in F water
20003301	20	Safflower, oil-babyfood	0.494000	1.000	1.000	Based on Beans in F water
01013310	1AB	Salsify, roots	0.380000	1.000	1.000	From Potato
02003320	2	Salsify, tops	0.266000	1.000	1.000	From Greens
95003330	O	Sapote, Mamey	0.494000	1.000	1.000	Based on Beans in F water
19013340	19A	Savory	0.494000	1.000	1.000	Based on Beans in F water
95003350	O	Seaweed	0.494000	1.000	1.000	Based on Beans in F water
95003351	O	Seaweed-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95003360	O	Sesame, seed	0.494000	1.000	1.000	Based on Beans in F water
95003361	O	Sesame, seed-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95003370	O	Sesame, oil	0.494000	1.000	1.000	Based on Beans in F water
95003371	O	Sesame, oil-babyfood	0.494000	1.000	1.000	Based on Beans in F water
03003380	3	Shallot	0.266000	1.000	1.000	From Beets
26003390	M	Sheep, meat	0.150000	1.000	1.000	
26003391	M	Sheep, meat-babyfood	0.150000	1.000	1.000	
26003400	M	Sheep, meat byproducts	0.150000	1.000	1.000	
26003410	M	Sheep, fat	0.150000	1.000	1.000	
26003411	M	Sheep, fat-babyfood	0.150000	1.000	1.000	
26003420	M	Sheep, kidney	0.150000	1.000	1.000	
26003430	M	Sheep, liver	0.150000	1.000	1.000	
15003440	15	Sorghum, grain	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15003450	15	Sorghum, syrup	0.152000	1.000	1.000	Based on Puffed Wheat (R)

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95003460	O	Soursop	0.166000	1.000	1.000	Based on Beans in F water
06003470	6	Soybean, seed	0.494000	1.000	1.000	From Beans (Cooked in F
06003480	6	Soybean, flour	0.494000	1.000	1.000	From Beans (Cooked in F
06003481	6	Soybean, flour-babyfood	0.494000	1.000	1.000	From Beans (Cooked in F
06003490	6	Soybean, soy milk	0.494000	1.000	1.000	From Beans (Cooked in F
06003491	6	Soybean, soy milk-babyfood or in	0.494000	1.000	1.000	From Beans (Cooked in F
06003500	6	Soybean, oil	0.494000	1.000	1.000	From Beans (Cooked in F
06003501	6	Soybean, oil-babyfood	0.494000	1.000	1.000	From Beans (Cooked in F
95003510	O	Spanish lime	0.494000	1.000	1.000	Based on Beans in F water
95003520	O	Spearmint	0.494000	1.000	1.000	Based on Beans in F water
95003530	O	Spearmint, oil	0.494000	1.000	1.000	Based on Beans in F water
19023540	19B	Spices, other	0.494000	1.000	1.000	Based on Beans in F water
19023541	19B	Spices, other-babyfood	0.494000	1.000	1.000	Based on Beans in F water
04013550	4A	Spinach	0.133000	1.000	1.000	From Lettuce
04013551	4A	Spinach-babyfood	0.133000	1.000	1.000	From Lettuce
09023560	9B	Squash, summer	0.019000	1.000	1.000	
09023561	9B	Squash, summer-babyfood	0.019000	1.000	1.000	
09023570	9B	Squash, winter	0.019000	1.000	1.000	
09023571	9B	Squash, winter-babyfood	0.019000	1.000	1.000	
95003580	O	Starfruit	0.494000	1.000	1.000	Based on Beans in F water
95003590	O	Strawberry	0.494000	1.000	1.000	Based on Beans in F water
95003591	O	Strawberry-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95003600	O	Strawberry, juice	0.494000	1.000	1.000	Based on Beans in F water
95003601	O	Strawberry, juice-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95003610	O	Sugar apple	0.494000	1.000	1.000	Based on Beans in F water
95003620	O	Sugarcane, sugar	0.494000	1.000	1.000	Based on Beans in F water
95003621	O	Sugarcane, sugar-babyfood	0.494000	1.000	1.000	Based on Beans in F water
95003630	O	Sugarcane, molasses	0.494000	1.000	1.000	Based on Beans in F water
95003631	O	Sugarcane, molasses-babyfood	0.494000	1.000	1.000	Based on Beans in F water
20003640	20	Sunflower, seed	0.494000	1.000	1.000	Based on Beans in F water
20003650	20	Sunflower, oil	0.494000	1.000	1.000	Based on Beans in F water
20003651	20	Sunflower, oil-babyfood	0.494000	1.000	1.000	Based on Beans in F water
01033660	1CD	Sweet potato	0.190000	1.000	1.000	
01033661	1CD	Sweet potato-babyfood	0.190000	1.000	1.000	
04023670	4B	Swiss chard	0.133000	1.000	1.000	From Lettuce
95003680	O	Tamarind	0.494000	1.000	1.000	Based on Beans in F water
10003690	10	Tangerine	0.019000	1.000	1.000	From Grapefruit Juice
10003700	10	Tangerine, juice	0.019000	1.000	1.000	From Grapefruit Juice
01033710	1CD	Tanier, corn	0.380000	1.000	1.000	From Potato
95003720	O	Tea, dried	5.000000	1.000	1.000	
95003730	O	Tea, instant	5.000000	1.000	1.000	
08003740	8	Tomatillo	0.038000	1.000	1.000	From Tomato
08003750	8	Tomato	0.038000	1.000	1.000	From Tomato
08003751	8	Tomato-babyfood	0.038000	1.000	1.000	From Tomato
08003760	8	Tomato, paste	0.038000	1.000	1.000	From Tomato
08003761	8	Tomato, paste-babyfood	0.038000	1.000	1.000	From Tomato
08003770	8	Tomato, puree	0.038000	1.000	1.000	From Tomato
08003771	8	Tomato, puree-babyfood	0.038000	1.000	1.000	From Tomato
08003780	8	Tomato, dried	0.038000	1.000	1.000	From Tomato
08003781	8	Tomato, dried-babyfood	0.038000	1.000	1.000	From Tomato
08003790	8	Tomato, juice	0.038000	1.000	1.000	From Tomato
95003800	O	Tomato, Tree	0.494000	1.000	1.000	Based on Beans in F water
15003810	15	Triticale, flour	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15003811	15	Triticale, flour-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
50003820	P	Turkey, meat	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
50003821	P	Turkey, meat-babyfood	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
50003830	P	Turkey, liver	1.000000	1.000	1.000	
50003831	P	Turkey, liver-babyfood	1.000000	1.000	1.000	
50003840	P	Turkey, meat byproducts	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
50003841	P	Turkey, meat byproducts-babyfood	5.580000	1.000	1.000	Fein & Cerklewski. 2001. J
A F C.49: 4284.						
50003850	P	Turkey, fat	1.000000	1.000	1.000	
50003851	P	Turkey, fat-babyfood	1.000000	1.000	1.000	

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50003860	P	Turkey, skin	1.000000	1.000	1.000	
50003861	P	Turkey, skin-babyfood	1.000000	1.000	1.000	
01033870	1CD	Turmeric	0.380000	1.000	1.000	From Potato
05023890	5B	Turnip, greens	0.076000	1.000	1.000	From Broccoli
01013880	1AB	Turnip, roots	0.380000	1.000	1.000	From Potato
95003900	O	Vinegar	0.494000	1.000	1.000	Based on Beans in F water
14003910	14	Walnut	1.200000	1.000	1.000	Field Trial 1/2 LOQ
95003970	O	Water chestnut	0.494000	1.000	1.000	Based on Beans in F water
95003980	O	Watercress	0.494000	1.000	1.000	Based on Beans in F water
09013990	9A	Watermelon	0.019000	1.000	1.000	From Squash
09014000	9A	Watermelon, juice	0.019000	1.000	1.000	From Squash
15004010	15	Wheat, grain	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15004011	15	Wheat, grain-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15004020	15	Wheat, flour	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15004021	15	Wheat, flour-babyfood	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15004030	15	Wheat, germ	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15004040	15	Wheat, bran	0.152000	1.000	1.000	Based on Puffed Wheat (R)
15004050	15	Wild rice	0.152000	1.000	1.000	Based on Puffed Wheat (R)
01034060	1CD	Yam, true	0.190000	1.000	1.000	From Sweet Potato
01034070	1CD	Yam bean	0.190000	1.000	1.000	From Sweet Potato

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## Attachment 5. Input Values Used in the Chronic Dietary Exposure Analysis of Fluoride from Water.

### DEEM-FCID

Filename: C:\My Documents\Chemistry Reviews\DEEM Runs\Sulfuryl Fluoride\Water.R98  
Chemical: Fluoride  
RfD(Chronic): .114 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day  
RfD(Acute): 0 mg/kg bw/day NOEL(Acute): 0 mg/kg bw/day  
Date created/last modified: 12-04-2003/11:14:52/8 Program ver. 1.30

EPA Code	Crop Grp	Commodity Name	Def Res (ppm)	Adj. Factors #1	Adj. Factors #2	Comment
86011000	O	Water, direct, tap	2.000000	1.000	1.000	99th Percentile
86012000	O	Water, direct, bottled	0.400000	1.000	1.000	50th Percentile
86013000	O	Water, direct, other	0.400000	1.000	1.000	50th Percentile
86014000	O	Water, direct, source-NS	0.400000	1.000	1.000	50th Percentile
86021000	O	Water, indirect, tap	2.000000	1.000	1.000	99th Percentile
86022000	O	Water, indirect, bottled	0.400000	1.000	1.000	50th Percentile
86023000	O	Water, indirect, other	0.400000	1.000	1.000	50th Percentile
86024000	O	Water, indirect, source-NS	0.400000	1.000	1.000	50th Percentile

### DEEM 7.87

Filename: C:\My Documents\Chemistry Reviews\DEEM Runs\Sulfuryl Fluoride\Water.RS7  
Chemical: Fluoride  
RfD(Chronic): .114 mg/kg bw/day NOEL(Chronic): 0 mg/kg bw/day  
RfD(Acute): 0 mg/kg bw/day NOEL(Acute): 0 mg/kg bw/day  
Date created/last modified: 01-08-2004/09:48:36/8 Program ver. 7.87  
Comment: The RfD is valid only for 70-kg & 2-L/Day populations.

Food Code	Crop Grp	Food Name	Def Res (ppm)	Adj. Factors #1	Adj. Factors #2	Comment
432	O	Water-bottled	0.400000	1.000	1.000	50th Percentile
434	O	Water-commercial processing	0.400000	1.000	1.000	50th Percentile
435	O	Water-non-food based	0.400000	1.000	1.000	50th Percentile
433	O	Water-tap	2.000000	1.000	1.000	99th Percentile

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## Attachment 6. Results of the Refined Chronic Dietary Exposure Analysis for Sulfuryl Fluoride.

U.S. Environmental Protection Agency Ver. 1.30  
 DEEM-FCID Chronic analysis for SULFURYL FLUORIDE (1994-98 data)  
 Residue file name: 078003-SF-AR-Likely CT.R98  
 Adjustment factor #2 used.  
 Analysis Date 11-12-2003/08:42:32 Residue file dated: 11-12-2003/08:41:32/8  
 Reference dose (RfD, Chronic) = .003 mg/kg bw/day  
 COMMENT 1: RfD is cPAD

=====

Total exposure by population subgroup

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Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.000003	0.1%
U.S. Population (spring season)	0.000003	0.1%
U.S. Population (summer season)	0.000004	0.1%
U.S. Population (autumn season)	0.000003	0.1%
U.S. Population (winter season)	0.000003	0.1%
Northeast region	0.000004	0.1%
Midwest region	0.000004	0.1%
Southern region	0.000003	0.1%
Western region	0.000003	0.1%
Hispanics	0.000002	0.1%
Non-hispanic whites	0.000004	0.1%
Non-hispanic blacks	0.000002	0.1%
Non-hisp/non-white/non-black	0.000002	0.1%
All infants (< 1 year)	0.000002	0.1%
Nursing infants	0.000001	0.0%
Non-nursing infants	0.000002	0.1%
Children 1-6 yrs	0.000004	0.1%
Children 7-12 yrs	0.000003	0.1%
Females 13-19 (not preg or nursing)	0.000001	0.0%
Females 20+ (not preg or nursing)	0.000003	0.1%
Females 13-50 yrs	0.000003	0.1%
Females 13+ (preg/not nursing)	0.000007	0.2%
Females 13+ (nursing)	0.000003	0.1%
Males 13-19 yrs	0.000002	0.1%
Males 20+ yrs	0.000004	0.1%
Seniors 55+	0.000004	0.1%
Children 1-2 yrs	0.000004	0.1%
Children 3-5 yrs	0.000004	0.1%
Children 6-12 yrs	0.000003	0.1%
Youth 13-19 yrs	0.000001	0.0%
Adults 20-49 yrs	0.000003	0.1%
Adults 50+ yrs	0.000004	0.1%
Females 13-49 yrs	0.000003	0.1%

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## Attachment 7. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from the Use of Sulfuryl Fluoride.

U.S. Environmental Protection Agency  
DEEM-FCID Chronic analysis for FLUORIDE ANION  
Residue file name: 078003-F-AR-Likely CT.R98

Ver. 1.30  
(1994-98 data)

Adjustment factor #2 used.

Analysis Date 12-04-2003/13:23:49

Residue file dated: 12-04-2003/13:21:59/8

Reference dose (RfD, Chronic) = .114 mg/kg bw/day

COMMENT 1: The RfD used in this analysis is valid only for populations having a body weight of 70 kg.

### ----- Total exposure by population subgroup -----

Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.000441	0.4%
U.S. Population (spring season)	0.000441	0.4%
U.S. Population (summer season)	0.000428	0.4%
U.S. Population (autumn season)	0.000448	0.4%
U.S. Population (winter season)	0.000448	0.4%
Northeast region	0.000456	0.4%
Midwest region	0.000438	0.4%
Southern region	0.000415	0.4%
Western region	0.000475	0.4%
Hispanics	0.000444	0.4%
Non-hispanic whites	0.000442	0.4%
Non-hispanic blacks	0.000425	0.4%
Non-hisp/non-white/non-black	0.000471	0.4%
All infants (< 1 year)	0.000533	0.5%
Nursing infants	0.000294	0.3%
Non-nursing infants	0.000624	0.5%
Children 1-6 yrs	0.001198	1.1%
Children 7-12 yrs	0.000687	0.6%
Females 13-19 (not preg or nursing)	0.000343	0.3%
Females 20+ (not preg or nursing)	0.000288	0.3%
Females 13-50 yrs	0.000323	0.3%
Females 13+ (preg/not nursing)	0.000336	0.3%
Females 13+ (nursing)	0.000398	0.3%
Males 13-19 yrs	0.000431	0.4%
Males 20+ yrs	0.000343	0.3%
Seniors 55+	0.000300	0.3%
Children 1-2 yrs	0.001328	1.2%
Children 3-5 yrs	0.001191	1.0%
Children 6-12 yrs	0.000728	0.6%
Youth 13-19 yrs	0.000389	0.3%
Adults 20-49 yrs	0.000323	0.3%
Adults 50+ yrs	0.000301	0.3%
Females 13-49 yrs	0.000300	0.3%

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# Attachment 8. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from the Use of Cryolite.

U.S. Environmental Protection Agency  
DEEM-FCID Chronic analysis for CRYOLITE  
Residue file name: Cryolite-AR-CT.R98

Ver. 1.30  
(1994-98 data)

Adjustment factor #2 used.

Analysis Date 12-04-2003/11:19:09 Residue file dated: 11-28-2003/13:16:45/8

Reference dose (RfD, Chronic) = .114 mg/kg bw/day

COMMENT 1: The RfD used in this analysis is valid only for populations having a body weight of 70 kg.

## ----- Total exposure by population subgroup

Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.000648	0.6%
U.S. Population (spring season)	0.000620	0.5%
U.S. Population (summer season)	0.000704	0.6%
U.S. Population (autumn season)	0.000604	0.5%
U.S. Population (winter season)	0.000667	0.6%
Northeast region	0.000772	0.7%
Midwest region	0.000636	0.6%
Southern region	0.000550	0.5%
Western region	0.000706	0.6%
Hispanics	0.000584	0.5%
Non-hispanic whites	0.000678	0.6%
Non-hispanic blacks	0.000569	0.5%
Non-hisp/non-white/non-black	0.000542	0.5%
All infants (< 1 year)	0.000945	0.8%
Nursing infants	0.000400	0.4%
Non-nursing infants	0.001152	1.0%
Children 1-6 yrs	0.002217	1.9%
Children 7-12 yrs	0.000808	0.7%
Females 13-19 (not preg or nursing)	0.000371	0.3%
Females 20+ (not preg or nursing)	0.000505	0.4%
Females 13-50 yrs	0.000477	0.4%
Females 13+ (preg/not nursing)	0.000317	0.3%
Females 13+ (nursing)	0.000432	0.4%
Males 13-19 yrs	0.000280	0.2%
Males 20+ yrs	0.000411	0.4%
Seniors 55+	0.000532	0.5%
Children 1-2 yrs	0.003105	2.7%
Children 3-5 yrs	0.002008	1.8%
Children 6-12 yrs	0.000848	0.7%
Youth 13-19 yrs	0.000324	0.3%
Adults 20-49 yrs	0.000424	0.4%
Adults 50+ yrs	0.000517	0.5%
Females 13-49 yrs	0.000452	0.4%

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## Attachment 9. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from Background Levels in Food.

U.S. Environmental Protection Agency  
DEEM-FCID Chronic analysis for FLUORIDE  
Residue file name: Worst-Case Background Food.R98

Ver. 1.30  
(1994-98 data)

Adjustment factor #2 NOT used.

Analysis Date 12-10-2003/11:12:42 Residue file dated: 12-10-2003/11:11:20/8

Reference dose (RfD, Chronic) = .114 mg/kg bw/day

COMMENT 1: Residues from Taves, D. R. 1983. Br. J. Nutr. 49:295-301 unless otherwise noted. The RfD used in this analysis is valid only for populations having a body weight of 70 kg.

### ----- Total exposure by population subgroup -----

Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.006825	6.0%
U.S. Population (spring season)	0.006770	5.9%
U.S. Population (summer season)	0.006746	5.9%
U.S. Population (autumn season)	0.006985	6.1%
U.S. Population (winter season)	0.006790	6.0%
Northeast region	0.007191	6.3%
Midwest region	0.006844	6.0%
Southern region	0.006561	5.8%
Western region	0.006897	6.0%
Hispanics	0.007829	6.9%
Non-hispanic whites	0.006470	5.7%
Non-hispanic blacks	0.007673	6.7%
Non-hisp/non-white/non-black	0.007840	6.9%
All infants (< 1 year)	0.009266	8.1%
Nursing infants	0.004621	4.1%
Non-nursing infants	0.011029	9.7%
Children 1-6 yrs	0.015259	13.4%
Children 7-12 yrs	0.008986	7.9%
Females 13-19 (not preg or nursing)	0.005477	4.8%
Females 20+ (not preg or nursing)	0.005163	4.5%
Females 13-50 yrs	0.005736	5.0%
Females 13+ (preg/not nursing)	0.005281	4.6%
Females 13+ (nursing)	0.005997	5.3%
Males 13-19 yrs	0.006897	6.0%
Males 20+ yrs	0.005780	5.1%
Seniors 55+	0.004897	4.3%
Children 1-2 yrs	0.017457	15.3%
Children 3-5 yrs	0.014939	13.1%
Children 6-12 yrs	0.009419	8.3%
Youth 13-19 yrs	0.006206	5.4%
Adults 20-49 yrs	0.005712	5.0%
Adults 50+ yrs	0.005027	4.4%
Females 13-49 yrs	0.005358	4.7%

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# Attachment 10. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from Water using DEEM 7.87.

U.S. Environmental Protection Agency  
DEEM Chronic analysis for FLUORIDE  
Residue file name: Water.RS7

Ver. 7.87  
(1994-98 data)

Adjustment factor #2 NOT used.  
Analysis Date 01-08-2004/10:29:56      Residue file dated: 01-08-2004/09:48:36/8  
Reference dose (RfD, Chronic) = .114 mg/kg bw/day  
COMMENT 1: The RfD is valid only for 70-kg & 2-L/Day populations.

## ----- Total exposure by population subgroup -----

Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.026879	23.6%
U.S. Population (spring season)	0.027103	23.8%
U.S. Population (summer season)	0.027679	24.3%
U.S. Population (autumn season)	0.026322	23.1%
U.S. Population (winter season)	0.026410	23.2%
Northeast region	0.025172	22.1%
Midwest region	0.027864	24.4%
Southern region	0.025923	22.7%
Western region	0.028870	25.3%
Hispanics	0.028031	24.6%
Non-hispanic whites	0.027042	23.7%
Non-hispanic blacks	0.023767	20.8%
Non-hisp/non-white/non-black	0.030336	26.6%
All infants (< 1 year)	0.142449	125.0%
Nursing infants	0.049603	43.5%
Non-nursing infants	0.177693	155.9%
Children 1-6 yrs	0.035279	30.9%
Children 7-12 yrs	0.021539	18.9%
Females 13-19 (not preg or nursing)	0.016465	14.4%
Females 20+ (not preg or nursing)	0.025770	22.6%
Females 13-50 yrs	0.023890	21.0%
Females 13+ (preg/not nursing)	0.020730	18.2%
Females 13+ (nursing)	0.030655	26.9%
Males 13-19 yrs	0.018647	16.4%
Males 20+ yrs	0.024904	21.8%
Seniors 55+	0.025240	22.1%
Children 1-2 yrs	0.040671	35.7%
Children 3-5 yrs	0.033816	29.7%
Children 6-12 yrs	0.022657	19.9%
Youth 13-19 yrs	0.017613	15.4%
Adults 20-49 yrs	0.025176	22.1%
Adults 50+ yrs	0.025630	22.5%
Females 13-49 yrs	0.023843	20.9%

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## Attachment 11. Results of the Refined Chronic Dietary Exposure Analysis for Fluoride from Water using DEEM-FCID.

U.S. Environmental Protection Agency  
DEEM-FCID Chronic analysis for FLUORIDE  
Residue file name: Water.R98Ver. 1.30  
(1994-98 data)

Adjustment factor #2 NOT used.

Analysis Date 01-13-2004/08:06:47

Residue file dated: 01-13-2004/08:05:35/8

Reference dose (RfD, Chronic) = .114 mg/kg bw/day

COMMENT 1: RfD is valid only for population groups w/ body weight of 70 kg and water consumption of 2 L/day

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Total exposure by population subgroup  
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Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
U.S. Population (total)	0.033555	29.4%
U.S. Population (spring season)	0.033361	29.3%
U.S. Population (summer season)	0.035292	31.0%
U.S. Population (autumn season)	0.031996	28.1%
U.S. Population (winter season)	0.033637	29.5%
Northeast region	0.030004	26.3%
Midwest region	0.035029	30.7%
Southern region	0.032676	28.7%
Western region	0.036562	32.1%
Hispanics	0.034914	30.6%
Non-hispanic whites	0.033007	29.0%
Non-hispanic blacks	0.033483	29.4%
Non-hisp/non-white/non-black	0.039616	34.8%
All infants (< 1 year)	0.100950	88.6%
Nursing infants	0.036495	32.0%
Non-nursing infants	0.125408	110.0%
Children 1-6 yrs	0.046755	41.0%
Children 7-12 yrs	0.030551	26.8%
Females 13-19 (not preg or nursing)	0.022844	20.0%
Females 20+ (not preg or nursing)	0.033660	29.5%
Females 13-50 yrs	0.031566	27.7%
Females 13+ (preg/not nursing)	0.028641	25.1%
Females 13+ (nursing)	0.047286	41.5%
Males 13-19 yrs	0.025390	22.3%
Males 20+ yrs	0.030375	26.6%
Seniors 55+	0.033564	29.4%
Children 1-2 yrs	0.049581	43.5%
Children 3-5 yrs	0.046475	40.8%
Children 6-12 yrs	0.032278	28.3%
Youth 13-19 yrs	0.024229	21.3%
Adults 20-49 yrs	0.031341	27.5%
Adults 50+ yrs	0.033491	29.4%
Females 13-49 yrs	0.030810	27.0%

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Attachment 12. Projected Market Share Analysis for Sulfuryl Fluoride.

MEMORANDUM

**SUBJECT:** Projections of Percent of Post Harvest Commodities That Are Likely to Be Treated with Sulfuryl Fluoride (SF) .

**FROM:** John Faulkner, Economist  
Economic Analysis Branch, BEAD (7503C)

**TO:** Dennis McNeilly  
RD (7505C)

**THRU:** David Widawsky, Chief  
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I reviewed Dow's (Bruce Houtman) estimates of potential % crop treated for sulfuryl fluoride (SF) for post harvest. I concur with the estimates, which are conservatively high and sometimes based on the assumption that SF could completely replace MBr if a CUE (critical use exemption) were not granted. The estimates are summarized in the following table and explained below.

<b>Commodity</b>	<b>Likely Projected Percent Treated with SF</b>	<b>Projected Maximum Percent Treated with SF</b>	<b>Basis of Estimate (Dow) More explanation below</b>
Tree nuts	20%	100%	SF would replace all of methyl bromide use.
Dried Fruit	40%	64%	SF would replace all of methyl bromide use.
Stored Grains	1.5-2%	10% <sup>1</sup>	<u>Flour mills:</u> 6 days of exposed grain per year. <u>Other stored grains:</u> SF would replace 10-14% of phosphine use.

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### **Tree nuts**

Methyl bromide is used on nearly all walnuts and about 3% of almonds. Dow estimates SF use would not exceed 10% on almonds and 20% on other nuts, but to maintain a conservative exposure estimate, they assume 100%.

### **Dried fruit**

Dow estimates that no more than 40% of dried fruits would be treated with SF, which seems reasonable since 64% of prunes and 28% of raisins are currently treated with methyl bromide and phosphine is also an alternative to SF and methyl bromide.

### **Stored Grains**

Percent of stored grains potentially treated with SF was estimated for both flour mills that have grain stored to be processed, and other stored grains. Both of these estimates resulted in the same projection of 1.5 - 2% of store grain potentially being treated with SF.

### **Flour Mills**

Wheat flour mills are typically fumigated 2-3 times per year, and there is enough stored grain to support 2 days of production at a typical flour mill facility. So 3 fumigations per year would mean 6 days of exposed production or  $6/350 = 1.7\%$  of the grain would be exposed to SF (Profume). This estimate may be conservative because if there is a tendency to draw down supplies before fumigation, then there may be less than 2 days of storage.

### **Other Stored Grains**

We concur with Dow's estimate, which is that SF would replace about 10% of phosphine usage. Since about 10-15%<sup>1</sup> of grain is treated with phosphine, then SF would be used on 1-1.5% of grain. The basis for SF replacing 10% of phosphine usage is:

1. Some Phosphine products are much easier to use. One formulation only requires that you drop pellets into water compared to application and monitoring equipment required for SF.
2. Unless the price difference between SF and the phosphine products changes radically SF is likely to only be used for resistance management.

### **References**

Emails from Bruce Houtman (bahoutman@dow.com) to RD (7505C), June-August, 2002.

Kenkel, P., et al. Current Management Practices & Impact of Pesticide Loss in the Hard Red Wheat Post-Harvest System. Circular E-930. 1993.

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<sup>1</sup> According to (Kenkel, et al, 1993) phosphine is used on 72% of elevator operations. However, it is not clear how much of the wheat is exposed to phosphine, which would depend on frequency of fumigation and turnover of wheat in the elevators. The estimated maximum is based on this estimate and SF replacing about 14% of this phosphine usage.



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